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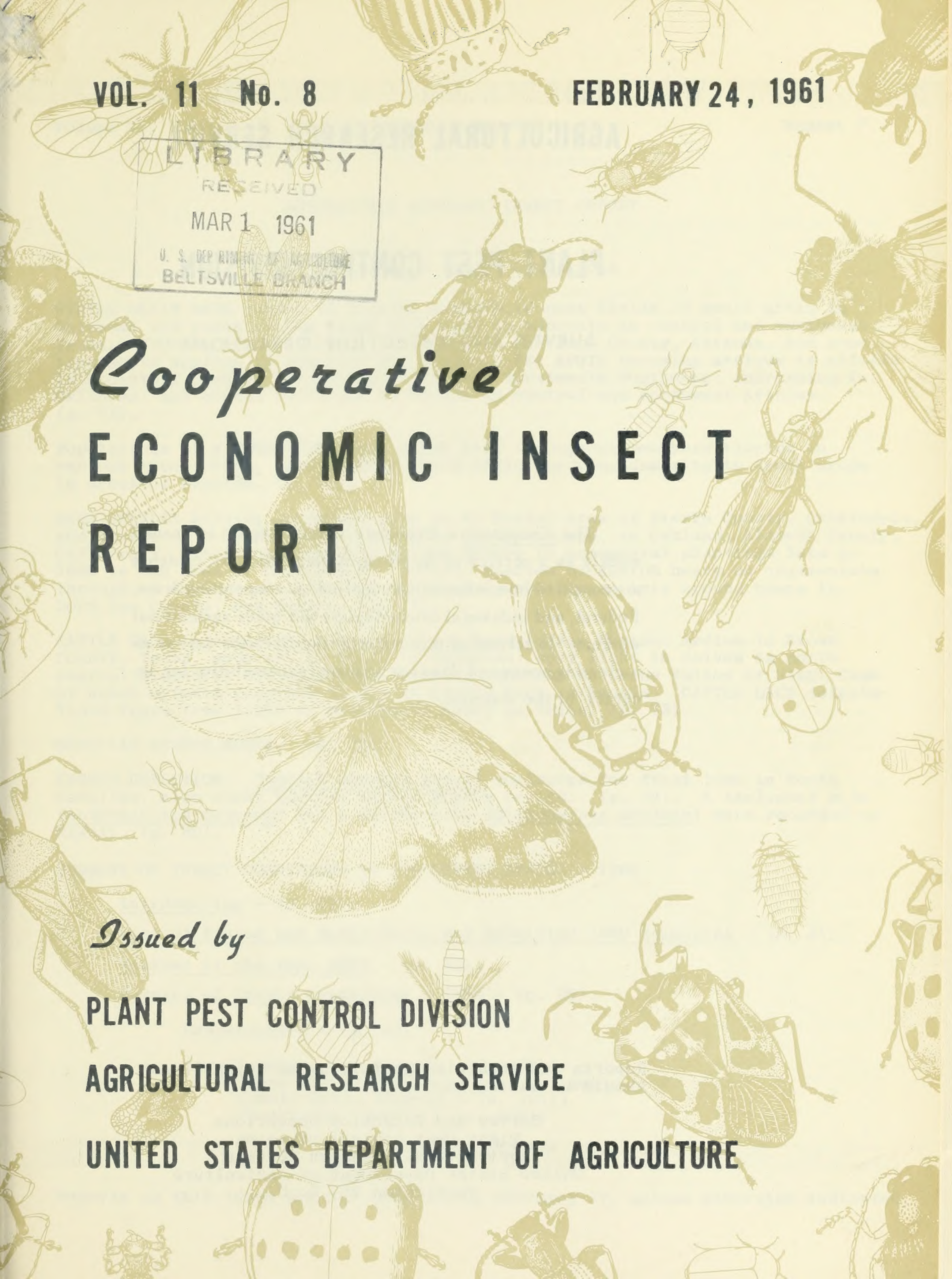

VOL. 11 No. 8 FEBRUARY 24, 1961

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Cooperative
ECONOMIC INSECT REPORT

Issued by

PLANT PEST CONTROL DIVISION
AGRICULTURAL RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

PLANT PEST CONTROL DIVISION

SURVEY AND DETECTION OPERATIONS

The Cooperative Economic Insect Report is issued weekly as a service to American Agriculture. Its contents are compiled from information supplied by cooperating State, Federal, and industrial entomologists and other agricultural workers. In releasing this material the Division serves as a clearing house and does not assume responsibility for accuracy of the material.

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Survey and Detection Operations
Plant Pest Control Division
Agricultural Research Service
United States Department of Agriculture
Washington 25, D. C.

Volume 11 February 24, 1961 Number 8

COOPERATIVE ECONOMIC INSECT REPORT

Highlights of Insect Conditions

WINTER GRAIN MITE common in limited numbers in most fields of small grain in Oklahoma and infestations range from none to moderate in central and northeast Texas. SPOTTED ALFALFA APHID increasing in Maricopa County, Arizona, and some treatments applied in southern New Mexico. PEA APHID becoming serious in alfalfa in Roosevelt County, New Mexico, with some treatments beginning; increasing in Oklahoma; and counts 50-75 per 10 sweeps in central and southwest Arizona. (p. 75).

Populations of a SERPENTINE LEAF MINER high throughout southern Florida on various truck crops. Also, GREEN PEACH APHID becoming damaging to truck crops in areas of Florida. (p. 76).

BARK BEETLES killing ponderosa pine in El Portal area of Sierra County, California, and larvae of a COSMOPTERYGID heavy in *Juniperus* spp. in Oakland, Alameda County, California. This cosmopterygid became severe in ornamental plantings late in 1959 in Bay area of California. Several species of APHIDS heavy on ornamentals throughout southern Arizona and building up rapidly on iris around homes in Dona Ana County, New Mexico. (p. 77).

CATTLE GRUB infestations range 6-35 per head in New Mexico; medium in Brown County, Texas; moderate to heavy in Oklahoma; very light in calves in north central Missouri; and sometimes becoming numerous in Cache Valley of Utah. Case of human myiasis reported in boy at Little Rock, Arkansas. CATTLE LICE infestations range from light to moderately heavy in Texas. (p. 78).

HAWAIIAN INSECT NOTES. (p. 80).

INSECT DETECTION: Cabbage seedpod weevil collected for first time in North Carolina; also first Eastern United States record. (p. 76). A laelaptid mite (*Androlaelaps setosus*) and a spider mite (*Oligonychus coffeae*) were recorded in Hawaii. (p. 80).

SUMMARY OF INSECT CONDITIONS IN THE UNITED STATES - 1960

Introduction - (p. 81).

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(Corn and Sorghum Insects - (p. 89))
(Small Grain Insects - (p. 101))
(Sugarcane Insects - (p. 107))

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Reports in this issue are for week ending February 17, unless otherwise indicated.

WEATHER BUREAU 30-DAY OUTLOOK

MID-FEBRUARY TO MID-MARCH 1961

The Weather Bureau's 30-day outlook for the period mid-February to mid-March calls for a reversal of the Nationwide weather pattern that has prevailed since early December. Over the eastern third of the Nation, where it has been unseasonably cold, temperatures are predicted to average above normal -- as much as 15° warmer than during the past month. On the other hand, the western half of the Nation, which has been unseasonably warm, is expected to average below normal, with coldest weather in the Northern Plains. In the intermediate zone, near-normal temperatures with large fluctuations are in prospect. Similarly, most of the country lying west of the Appalachians is expected to receive above-normal precipitation, in contrast to the deficient amounts of the winter season. Much of this precipitation will fall as sleet and snow over the northern half of this area. East of the Appalachians precipitation is expected to diminish to near normal, and, in the Southeast, below normal. The reason for this expected reversal of weather pattern lies in a change in the prevailing upper air wind streams over the Northern Hemisphere, which is more accentuated than the normal seasonal change.

Weather forecast given here is based on the official 30-day "Resume and Outlook," published twice a month by the Weather Bureau. You can subscribe through Superintendent of Documents, Washington 25, D. C. Price $4.80 a year, $2.40 a half year.

WEATHER OF THE WEEK ENDING FEBRUARY 20

The week was unseasonably mild. Temperatures were a little lower than last week in the Far West, but they still averaged from 3° to 10° above normal in the Rocky Mountains and slightly above in the Great Basin. From the central and lower Mississippi Valley to the Atlantic coast, this week was 10° to 15° warmer than last week and 10° to 15° warmer than normal. This was the warmest week in parts of the Ohio Valley and Northeast since last October or November. Chicago, Illinois, had 62° on the 18th, and Boston, Massachusetts, 65° on the 19th.

Precipitation was widespread, occurring nearly every day in extreme northern areas, and on 2 or 3 days in most of the remainder of the Nation. Weekly totals ranged up to more than 6 inches along the north Pacific coast, and some flooding occurred in western Oregon and northern California. Scattered thunderstorms occurred in the latter State on the 16th and winds up to 60 m.p.h. were reported along the north coast. The week's precipitation was generally moderate to heavy from the eastern portions of the central and lower Great Plains and Great Lakes to the Atlantic coast. Most of this precipitation occurred on the 17th and 18th when a storm system moved from the lower Great Plains northward across the Great Lakes. This storm produced 5 to 6 inches of rain on the 16th and 17th in southeastern Texas, resulting in minor flooding in streams near the Gulf of Mexico.

Severe thunderstorms occurred in Oklahoma and Kansas. Several tornadoes in central Oklahoma injured more than a dozen persons and caused considerable property damage. In a hailstorm near Wichita, Kansas, stones 1 to 4 inches in diameter were reported. Kansas had glaze in the northwestern part of the State on the 17th and rain and snow in central portions. On the 17th and 18th, a belt of glaze extended across Iowa, causing considerable damage, and 10 to 15 inches of snow fell in some northern sections of the State. Heavy snow also fell in the southern two-thirds of Minnesota and northern Wisconsin, with heavy drifting in the latter State. High temperatures melted much of the northeastern snow cover, and coastal areas of Maryland and New Jersey are mostly bare; and in southern New England the cover is less than 5 inches. (Summary supplied by U. S. Weather Bureau).

CEREAL AND FORAGE INSECTS

GREENBUG (Toxoptera graminum) - OKLAHOMA - Definite drop in populations (up to 75 percent reduction in some fields) noted in all areas checked, but some fields in Kingfisher County continue to show moderate increases. Counts in south central, southwest and west central areas averaged less than 10 per linear foot and from 15-150 per linear foot in several fields checked in Hennessey area of Kingfisher County. (Okla. Coop. Sur.). TEXAS - Populations continue to be very light to light in fields checked. (Newton).

ENGLISH GRAIN APHID (Macrosiphum granarium) - OKLAHOMA - Despite considerable reduction in populations throughout State during past 2 weeks, this species continues most common aphid in small grain in most areas. Counts in south central, southwest and west central areas averaged less than 20 per linear foot; only isolated infestations in Beckham and Kingfisher Counties averaged from 25-100 per linear foot. (Okla. Coop. Sur.).

APPLE GRAIN APHID (Rhopalosiphum fitchii) - OKLAHOMA - Common in approximately one-half of fields of small grain checked in south central, southwest, west central and central areas. Counts averaged up to 20 per linear foot in most infested fields; counts in few isolated fields in west central averaged up to 75 per linear foot. (Okla. Coop. Sur.).

CORN LEAF APHID (Rhopalosiphum maidis) - OKLAHOMA - Present in very limited numbers in a small percentage of small grain fields checked in most areas. (Okla. Coop. Sur.).

HESSIAN FLY (Phytophaga destructor) - MISSOURI - No infestation found in most north central area fields checked. In 2 infested fields, counts were as follows: 1 - 40 percent of plants infested with 60 pupae per 100 plants; 2 - 10 percent of plants infested with 5 pupae per 100 plants. (Munson, Thomas, Wood).

WINTER GRAIN MITE (Penthaleus major) - OKLAHOMA - Common in limited numbers, averaged less than 10 per linear foot, in most fields of small grain throughout State. (Okla. Coop. Sur.). TEXAS - Infestations range from none to moderate in central and northeast counties, with heaviest populations apparently centered in Hunt, Collin and Ellis Counties. (Newton).

SPOTTED ALFALFA APHID (Therioaphis maculata) - ARIZONA - Infestations increasing in Maricopa County alfalfa, with counts averaging 2-3 per trifoliate leaf in some fields. (Ariz. Coop. Sur.). NEW MEXICO - Infestations continue relatively light in alfalfa in southern counties, with an occasional moderate to heavy infestation requiring treatment. (N. M. Coop. Rpt., Feb. 10). Very little apparent buildup noted in Dona Ana County alfalfa. (N. M. Coop. Rpt.). TEXAS - Averaged 10-15 per sweep in Burleson County alfalfa with approximately 75 percent being young forms. (Newton). OKLAHOMA - Common in limited numbers, less than 5 per square foot of crown area, in alfalfa checked in southeast, south central, southwest, west central, central and north central areas. (Okla. Coop. Sur.).

PEA APHID (Macrosiphum pisi) - OKLAHOMA - A slight increase in numbers noted in alfalfa checked in southeast, south central, southwest, west central and north central areas where counts averaged up to 20 per square foot of crown area. (Okla. Coop. Sur.). ARIZONA - Infestations averaged 50-75 per 10 sweeps in alfalfa in central and southwest areas. (Ariz. Coop. Sur.). NEW MEXICO - Becoming serious in both seedling and established stands of alfalfa in Roosevelt County. Growers beginning to treat. Infestations generally light in Mesilla Valley alfalfa. (N. M. Coop. Rpt.).

LYGUS BUGS (Lygus spp.) - OKLAHOMA - Common in most alfalfa in southeast, south central, southwest, west central and north central areas where counts averaged 0.1-1 per square foot of crown area. Species mostly L. lineolaris. (Okla. Coop. Sur.). NEW MEXICO - Adults becoming active in Dona Ana County alfalfa. Counts average about 8-15 per 100 sweeps. (N. M. Coop. Rpt.).

THREE-CORNERED ALFALFA HOPPER (Spissistilus festinus) - NEW MEXICO - Occasional adult collected while sweeping alfalfa in southern counties. (N. M. Coop. Rpt.).

ALFALFA CATERPILLAR (Colias eurytheme) - NEW MEXICO - Only one larva found in alfalfa in southern Dona Ana County. (N. M. Coop. Rpt.).

SPRINGTAILS (Sminthuridae) - TEXAS - Averaged 20-25 per sweep in Burleson County alfalfa and apparently doing a limited amount of leaf feeding. (Newton).

A SCALE INSECT (Odonaspis ruthae) - NEW MEXICO - Heavy overwintering populations on Bermuda grass lawns in Dona Ana County. (N. M. Coop. Rpt., Feb. 10).

FRUIT INSECTS

WHITE PEACH SCALE (Pseudaulacaspis pentagona) - FLORIDA - Quite active in Gainesville area of Alachua County and appear to be killing some individual branches of infested peach trees. (Fla. Coop. Sur.).

SAN JOSE SCALE (Aspidiotus perniciosus) - NEW MEXICO - Infestation nonexistant in some orchards in Hondo Valley, Lincoln County; light to extremely heavy in others. (N. M. Coop. Rpt.).

A FRUIT TREE MITE (Bryobia rubrioculus) - NEW MEXICO - Eggs very abundant on branches of apple trees in orchards in High Rolls and Mountain Park areas, Otero County. (N. M. Coop. Rpt., Feb. 10).

PECAN LEAF CASEBEARER (Acrobasis juglandis) and PECAN NUT CASEBEARER (A. caryae) - GEORGIA - Observed on pecan trees in Toombs and Bulloch Counties. Fifty percent of buds examined had one or the other of these insects attached to it in the overwintering stage. (Johnson).

TRUCK CROP INSECTS

CABBAGE SEEDPOD WEEVIL (Ceutorhynchus assimilis) - NORTH CAROLINA - Collected for first time in State on May 16, 1960, in Henderson County. One to 2 adults per turnip plant found. This is also a new eastern United States record. Det. by R. E. Warner. (Chalfant).

A SERPENTINE LEAF MINER - FLORIDA - Population high throughout southern half of State, averaging 25-35 per leaflet on celery at Belle Glade, Palm Beach County. Considered the most severe pest on tomatoes in Ft. Pierce, St. Lucie County, area where adults seem to be on decline, but heavy egg deposition has occurred. Populations extremely high in abandoned fields and are a constant source of trouble. Severe infestations on potatoes, watermelons and tomatoes in Redlands area of Dade County worst since the 1947-48 infestations. Reinfestations seem to override whatever treatment that is applied. (Fla. Coop. Sur.).

GREEN PEACH APHID (Myzus persicae) - FLORIDA - Numerous on cabbage in Alachua County area; retarding plant growth considerably. Some heavy, scattered infestations on lower leaves at Belle Glade, Palm Beach County. Infestations below normal on celery at Belle Glade, averaging one per 10 leaflets. Building up to injurious proportions on potatoes and some on tomatoes in Redlands area, Dade County, averaging as many as 100 plus per leaf. (Fla. Coop. Sur.).

CABBAGE LOOPER (Trichoplusia ni) - FLORIDA - Increasing in Sanford, Seminole County, area and averaging 11 per 25 heads on cabbage at Belle Glade, Palm Beach County, on untreated plants. (Fla. Coop. Sur.).

IMPORTED CABBAGEWORM (Pieris rapae) - FLORIDA - Uncommon in Sanford area and averaging 3 per 25 heads on cabbage at Belle Glade on untreated plants. (Fla. Coop. Sur.).

SOUTHERN GREEN STINK BUG (Nezara viridula) - FLORIDA - Not a pest in Belle Glade on cabbage; only one found in 25 heads examined. (Fla. Coop. Sur.).

THRIPS - NEW MEXICO - Averaged 20-70 per plant on seed onions in southern Dona Ana County. Young plants had counts averaging 2-8 per plant. (N. M. Coop. Rpt.).

A BULB MITE (Rhizoglyphus sp.) - ARIZONA - Heavy infestation present in a Maricopa County garlic field. Mites feeding on basal end of bulbs and causing considerable damage. (Ariz. Coop. Sur.).

TOBACCO INSECTS

VEGETABLE WEEVIL (Listroderes costirostris obliquus) - GEORGIA - Light infestations on tobacco in the plant bed in Emanuel, Bulloch, Tattnall, Irwin and Tift Counties. (Johnson).

FOREST, ORNAMENTAL AND SHADE TREE INSECTS

BARK BEETLES - CALIFORNIA - Dendroctonus brevicomis and Ips sp. killing ponderosa pine in groups up to 100 trees in El Portal area of Sierra County. Some 225 trees dead in a 200-acre stand, with damage increasing. This infestation appears to have developed from 8 infested trees in September. This is an area immediately adjacent to Yosemite National Park. (Cal. Coop. Rpt.).

NANTUCKET PINE TIP MOTH (Rhyacionia frustrana) - OKLAHOMA - Counts averaged 0.5-3 larvae or pupae per pine seedling 2 feet high or less in McCurtain and Pushmataha Counties. (Okla. Coop. Sur.).

A COSMOPTERYGID - CALIFORNIA - Larval infestation heavy in Juniperus spp. in Oakland, Alameda County. Damage by this species not determined as yet, became severe in ornamental plantings late in 1959 in the Bay region and inland as far as Sacramento County. (Cal. Coop. Rpt.).

SPIDER MITES - NEW MEXICO - Building up on juniper in Las Cruces area, Dona Ana County. (N. M. Coop. Rpt., Feb. 10).

EASTERN TENT CATERPILLAR (Malacosoma americanum) - FLORIDA - Collected on wild black cherry at Gainesville, Alachua County, on February 15. (Hetrick). Eggs hatching at Gainesville; fewer egg masses than usual. (Fla. Coop. Sur.).

A PHYCITID (Euzophera sp., probably ostricolorella) - FLORIDA - In 1958, lepidopterous caterpillars reported damaging Magnolia grandiflora roots in field-grown nursery stock in Baker County. Larval specimens collected during February, April and July but reared adults necessary for determination. On February 9, 1961, larvae were collected by J. C. Denmark from container-grown M. grandiflora at Winter Haven where approximately 150 plants were ruined. A spiral girdle was produced on the trunk by the larva and feeding occurred below ground in larger roots. An attempt is being made to rear adults to confirm identification. Larval determinations made by H. W. Capps. E. ostricolorella not previously reported south of Georgia. (Fla. Coop. Sur.).

ELM LEAF BEETLE (Galerucella xanthomelaena) - OKLAHOMA - Adults continue active in some homes in north central area which had been serving as hibernation quarters. (Okla. Coop. Sur.).

APHIDS - ARIZONA - Heavy populations of several species appearing on shrubs and flowers throughout southern part of State. (Ariz. Coop. Sur.). NEW MEXICO - Moderate to heavy infestation of Macrosiphum sanborni on chrysanthemums, but causing no appreciable damage, in Dona Ana County. M. rosae populations remain light to heavy on roses throughout southern counties. (N. M. Coop. Rpt., Feb. 10).

Unspecified species building up rapidly on iris around homes in Dona Ana County. (N. M. Coop. Rpt.). OKLAHOMA - Several species light to moderate in pines in McCurtain and Pushmataha Counties. (Okla. Coop. Sur.).

WHITEFLIES - NORTH CAROLINA - Many puparia, mostly empty, on gardenia and causing leaf drop locally in Wake County. (Gast, Farrier).

EUONYMUS SCALE (Unaspis euonymi) - NORTH CAROLINA - Severe infestation on euonymus locally in Iredell County. (Ivey, Farrier). MARYLAND - Infesting euonymus locally in Baltimore. (U. Md., Ent. Dept., Feb. 9).

RED WAX SCALE (Ceroplastes rubens) - FLORIDA - Collected on a tropical breadfruit at Homestead, Dade County, on January 11. (E. M. Collins, C. F. Dowling).

INSECTS AFFECTING MAN AND ANIMALS

COMMON CATTLE GRUB (Hypoderma lineatum) - NEW MEXICO - Grubs from third instar to fifth still being found in backs of cattle throughout State; average 6-35 per head. (N. M. Coop. Rpt., Feb. 10). TEXAS - Counts on 50 mature animals in Brown County ranged 3-30, average 12-15, per animal. (Newton). OKLAHOMA - Moderate to heavy infestations continue common in cattle throughout State. Some decrease noted in several areas. Counts range 0-41 per animal, average 6, on 38 yearling steers in Payne County. (Okla. Coop. Sur.). ARKANSAS - Case of human myiasis reported. A first-instar larva expressed from a point below the eye of a four-year-old boy by Dr. J. H. Crosse, Jr. at Little Rock. Det. by Dr. M. T. James. Another larva was expressed the week before from the back shoulder of this boy. The patient had a history of boils and also arthritic-like pains in his knee. The child was admitted to a hospital in Little Rock for observation in good health; no other larvae were found. The patient's home is in Little Rock, but he often visited a farm near Conway. Both locations in central area. (Boyer). Grub counts in cattle in Benton County on February 10 were 27 in 40 treated cattle and 148 in 20 untreated cattle. (Lancaster).

CATTLE GRUBS (Hypoderma spp.) MISSOURI - Very light infestation in feeder calves in north central area; counts ranged 0-6 and averaged 0.4 per animal. (Munson, Thomas, Wood). UTAH - Grubs present in backs of cattle in Cache Valley, sometimes becoming numerous. (Knowlton). NORTH DAKOTA - Inspection of 46 head of cattle at an eastern sales yard showed only one infested animal. (N. D. Ins. Sur., Jan. 23-Feb. 10).

MOSQUITOES - TEXAS - January collections in Jefferson County more numerous than in January 1960. Predominant species was Culex spp., probably mostly C. salinarius. Significant numbers of C. nigripalpus, C. fatigans and Culiseta inornata also taken. (Jefferson County Mosq. Cont. Comm.).

SHEEP KED (Melophagus ovinus) - UTAH - Numerous in farm flocks at Mendon and Logan in Cache County. (Knowlton).

CATTLE LICE - TEXAS - Reports from all sections of State indicate that at least one or more species present. Infestations range from light to moderately heavy on those cattle checked. (Newton). NORTH DAKOTA - Infestations generally light on cattle examined in an eastern area sales barn. (N. D. Ins. Sur. Jan. 23-Feb. 10).

WASPS (Polistes spp.) - OKLAHOMA - Becoming active in Stillwater area during periods of mild weather. (Okla. Coop. Sur.).

TROPICAL RAT MITE (Ornithonyssus bacoti) - TEXAS - Found infesting a home in Lee County. Children bitten underneath clothing on tender areas of body. Det. by McDaniel. (Spivey).

STORED-PRODUCT INSECTS

INDIAN-MEAL MOTH (*Plodia interpunctella*) - UTAH - Outbreak in a grocery store at Logan caused much labor and some financial loss. (Knowlton). NORTH DAKOTA - Light larval infestations of this species and *Ephestia* sp. observed in several commercial grain storage units in eastern area. (N. D. Ins. Sur., Jan. 23-Feb. 10).

DRUGSTORE BEETLE (*Stegobium paniceum*) - UTAH - Numerous in spice at Logan. Det. by T. J. Spilman. (Knowlton, Raghuvir).

BENEFICIAL INSECTS

HONEY BEE (*Apis mellifera*) - WISCONSIN - Good and excellent overwintering reported for colonies which are provided with ample stores. Cleansing flights observed during week ending February 10. (Wis. Coop. Sur.).

LADY BEETLES - NEW MEXICO - Becoming prevalent in alfalfa and cotton fields in southern counties. (N. M. Coop. Rpt.). OKLAHOMA - Limited number of *Hippodamia convergens* adults noted in some small grain and alfalfa checked in south central, southwest, west central and central areas. (Okla. Coop. Sur.).

LACEWINGS (*Chrysopa* spp.) - OKLAHOMA - Present in limited numbers in small percentage of alfalfa and small grain fields checked in most areas; abundant in some arborvitae bushes in Stillwater area. (Okla. Coop. Sur.). NEW MEXICO - Becoming prevalent in alfalfa and cotton fields in southern counties. (N. M. Coop. Rpt.).

NABIDS (*Nabis* spp.) - OKLAHOMA - Common and active in alfalfa and small grain fields in most areas. (Okla. Coop. Sur.).

HYMENOPTEROUS PARASITES - OKLAHOMA - Light numbers noted in few fields of small grain checked in south central area. (Okla. Coop. Sur.).

MISCELLANEOUS INSECTS

CLOVER MITE (*Bryobia praetiosa*) - NEW MEXICO - Many homeowners at Raton, Colfax County, report this pest entering homes in extremely large numbers as weather became warm and then turned cold again. (N. M. Coop. Rpt., Feb. 10).

MUSHROOM MITE (*Tyrophagus putrescentiae*) - TEXAS - Heavy in kitchen cabinet of private home in Austin. No dermatitis has been associated with the mite by any member of the household. Det. by Strandtmann. (Wisemann).

LIGHT TRAP COLLECTIONS

	Peridroma saucia	Spodoptera exigua	Prodenia ornithogalli	Feltia subterranea	Pseudaletia unipuncta
ARIZONA					
Mesa 2/8-12	7	14	1		
FLORIDA					
Monticello 2/14				3	1

HAWAIIAN INSECT NOTES

The following reports were submitted by the Hawaiian Entomological Society for use in the Cooperative Economic Insect Report. The reports were abstracted from the "Notes and Exhibitions" in the minutes of the February 13, 1961, meeting.

A single specimen of a LEAFHOPPER (*Protalabrella brasiliensis*) was taken in a light trap on September 13, 1960, at the Public Health Service Quarantine Station, Ft. Armstrong, Honolulu, Hawaii. Det. by J. P. Kramer. Since no additional specimens have been taken in Hawaii after the above date, it is believed that the species is not established. A LAELAPTID MITE (*Androlaelaps setosus*) was collected from rodents at several different times during recent years. In the Public Health Service Quarantine Station records, this species was taken from native Hawaiian rat (*Rattus exulans hawaiiensis*) trapped near Ewa, Oahu, on January 30, 1958; removed from 2 *Rattus norvegicus* trapped in Niu Valley, Oahu, in February 1960; and from a house mouse (*Mus musculus*) trapped near Pier 41, Honolulu Harbor on November 25, 1960. These records indicate that the mite is established in Hawaii and may feed on a variety of rodent species. The identification was confirmed by Dr. D. P. Furman. (Dr. C. R. Joyce).

Adult moths of LIGHT-BROWN APPLE MOTH (*Austrotortrix postvittana*) were reared from terminal shoots of common gorse (*Ulex europaeus*) collected by Davis and Miyahira at Olinda, Maui, on 13 January 1961. This tortricid was previously collected from gorse at Humuula, Hawaii, in 1956 by Harry Nakao. The caterpillars feed on the spines, stems and growing tips of gorse. (M. Chong).

A SPIDER MITE (*Oligonychus coffeae*) was collected from leaves of tropical-almond terminalia (*Terminalia catappa*) by E. J. Ford on April 23, 1960, on Oahu. This is a new State record. Determined by E. W. Baker. The TORTRICID moths reported at the January 9 meeting (CEIR 11 (6):60) were determined by Mr. H. W. Capps as a new species to Hawaii. The identification was based on 2 larvae collected by R. A. Bergman in litchi fruit on April 20, 1960. However, Mr. Capps stated on the determination that the larvae may be either *Cryptophlebia ombrodelta* or *C. peltasticta* since the U. S. National Museum does not have representative larvae of either species. (L. M. Chilson).

A heavy infestation of a mango tree in Kaimuki by a SCOLYTID (*Hypocryphalus mangiferae*) was reported on January 10, 1961. The bark beetles caused large areas of the branches and leaves to dry out. (Kim).

Adults of two NOCTUIDS (*Autographa biloba* and *Meliana* sp.) were collected on Molokai for the first time at light, February 2 and 3, 1961. *A. biloba* has been reported previously from all of the principal Hawaiian Islands, except Molokai, and *Meliana* sp. has been heretofore reported only from Oahu. Three specimens of a BILLBUG (*Sphenophorus venatus vestitus*) were collected at Kuliouou, Oahu, during November 1960 by a University of Hawaii entomology student. This indicates that the species is definitely established in Hawaii and has spread. (J. W. Beardsley).

SUMMARY OF INSECT CONDITIONS IN THE UNITED STATES - 1960

Introduction

The summary of insect conditions beginning in this issue and continuing in several succeeding issues of the Cooperative Economic Insect Report was compiled in Survey and Detection Operations from annual summaries that were submitted by cooperating states. This is the second year that a compiled summary has been published. The first, for the year 1959, was published in several issues of Volume 10. The summary will follow the same format which is used in the weekly issues of the CEIR. The summary of "Forest Insect Conditions in the United States, 1960", which is compiled by Forest Insect Research, U. S. Forest Service, will be reissued in the CEIR after its release by the Forest Service. Since this forest insect summary is based largely on conditions in forests only, notes on ornamental and shade tree insects are not included or only briefly mentioned. This being the case, special notes covering those insects of ornamental plants and shade trees, as submitted by the various states, will be included in the CEIR under a special section.

Listed below are the names of individuals who submitted the 1960 summaries. We are especially grateful to each individual who assisted with the preparation of these summaries, also the cooperators who assembled the information. We are sorry that space does not permit the inclusion of all names of those who helped assemble data for the summary.

List of States and Individuals who Submitted Summaries

ALASKA - R. H. Washburn

ARIZONA - Leon Moore

ARKANSAS - W. P. Boyer

CALIFORNIA - R. M. Hawthorne

COLORADO - Ent. Sect., Colorado Exp. Station

CONNECTICUT - J. P. Johnson

DELAWARE - P. Burbutis, A. Mason

FLORIDA - R. E. Woodruff, W. A. Simanton

GEORGIA - W. C. Johnson

ILLINOIS - C. E. White

INDIANA - J. V. Osmun

IOWA - H. Gunderson, W. S. Craig

KANSAS - L. L. Peters

LOUISIANA - W. T. Spink

MAINE - L. W. Boulanger

MARYLAND - W. C. Harding, Jr.

MICHIGAN - Ray Hutson

MINNESOTA - R. G. Flaskerd

MISSOURI - G. Thomas, G. Munson, F. E. Wood

MONTANA - G. R. Roemhild

NEBRASKA - P. W. Bergman, R. E. Roselle

NEVADA - R. C. Bechtel

NEW HAMPSHIRE - J. C. Conklin

NEW MEXICO - New Mex. Coop. Sur.

NORTH CAROLINA - M. H. Farrier

NORTH DAKOTA - V. V. Goodfellow

OKLAHOMA - H. W. VanCleave

OREGON - Joe Capizzi

PENNSYLVANIA - J. O. Pepper

RHODE ISLAND - H. L. Hansen

SOUTH DAKOTA - G. B. Mast

TENNESSEE - R. P. Mullett

TEXAS - J. H. Hawkins, W. H. Newton

UTAH - G. F. Knowlton

VERMONT - J. W. Scott

VIRGINIA - W. A. Tarpley

WISCONSIN - P. W. Smith, M. S. Conrad

WYOMING - D. G. Fullerton

Also included in the 1960 summary are special notes from the "Summary of Fruit Insect Conditions, 1960 New York-New England Fruit Spray Specialist Conference", compiled by L. W. Boulanger, Maine Agricultural Experiment Station, from the conference held at Durham, New Hampshire, on November 2, 1960; special Plant Pest Control Division summary statements; a West Virginia summary of "Arthropod Pests of Livestock - Survey 1960" compiled from 23 veterinarian reports from 24 counties; and a weather summary of the year 1960 compiled by the U. S. Weather Bureau.

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Weather of the Year 1960

GENERAL - Heat and drought in the Far West during the warm season, frequent winter-type storms east of the Rocky Mountains, heavy rainfall and floods in Texas, and a destructive hurricane in September were the weather highlights of 1960. East of the Rockies, the coldest weather of the 1959-1960 winter came in March -- a very unusual occurrence. Deficient winter snowfall in the western mountains, followed by a hot, dry summer resulted in short irrigation water in some sections, and created favorable conditions for forest fires which burned large tracts. A cold, wet spring and early summer in the Corn Belt delayed spring planting, but favorable weather in late summer and autumn favored development and late frost permitted maturity. Spring freezes cut production of fruit crops in some sections of the Far West, dry spring weather cut early hay crops in the Southeast, and July heat cut grain crops in the Northwest and northern Great Plains. Despite all these vicissitudes of weather, however, the overall crop production was the greatest of record.

JANUARY-MARCH - The Weather during the first 3 months of 1960 generally was cold and stormy east of the Rocky Mountains. During a cold wave in the Far West early in January, freezing in the Far Southwest damaged some young fruit trees in southern California and some fruit and vegetables in the vicinity of Yuma, Arizona. During another cold period, felt mostly east of the Rockies from the 18th to 24th of January, a freeze in the South extensively damaged Florida's winter vegetable crop. The latter part of January and the first 16 days of February were a period of Nationwide mild weather, only to be followed by 2 weeks of Nationwide below-normal temperatures as the weather became progressively colder east of the Rockies through the first week of March and remained unusually cold until near the end of the month. This prolonged cold period east of the Rockies resulted in the coldest February in 25 to 40 years in much of the central portion of the Nation and the coldest March on record at most stations in an area including eastern portions of Kansas and Nebraska and extending from Iowa, Missouri, and Arkansas to the Atlantic coast. At Peoria, Illinois, where records began in 1856, March 1960 was 5.8° colder than the previous coldest March of 1912. For the following states, low temperature records for March were equaled or new ones established: Iowa, -31°; Missouri, -26°; West Virginia, -22°; Maryland, -20°; Illinois, -19°; Kentucky, -14°; Mississippi, -8°; Delaware and Tennessee, -1°; and South Carolina, 1°. At Burlington and Dubuque, Iowa, the Mississippi River remained frozen over until the last day or two of March, and was not opened for navigation until the 31st, the latest date in many years. Snowfall during February and March was unprecedented in much of the area east of the Rocky Mountains. Many stations in the central portion of the country measured their greatest snowfall for February, including Goodland, Kansas, 25.4 inches; Kansas City, Missouri, 20.7; Lincoln, Nebraska, 19.2; Lexington, Kentucky, 16.4; and Lake Charles, Louisiana, 5.0 inches. At many stations from the central portion of the country to the Atlantic coast March snowfall was the greatest of record as storm systems moved across the eastern half of the Nation at about 4-day intervals. Among the new March snowfall records were: Columbia, Missouri, 24.5 inches; Louisville, Kentucky, 22.9; Pittsburgh, Pennsylvania, 21.3; Richmond, Virginia, 19.7; Charleston, South Carolina, 1.0; Atlanta, Georgia, 4.8; and Nantucket, Massachusetts, 40.2 inches, which was the greatest total there for any month. At the end of March, new record seasonal totals were reported by a number of stations in the Midwest, including a 68.8-inch total at Dubuque, Iowa, where records go back 98 years. The heavy snowfall melted very slowly owing to the persistent cold weather and accumulations reached record depth at many stations, among which was Concordia, Kansas, where a 25.0-inch depth on March 16 was the greatest depth ever measured there in any month. During the first few days of March a destructive combination of glaze, sleet, and snow from southern Arkansas to the southern Appalachian region damaged forests, power and communication lines, farm buildings, and forced many schools and businesses to close from 2 to 4 days; a number of counties in northern Alabama and Georgia were declared disaster areas by the Federal Government. The heavy snow cover, however, protected the winter grain crop from the extreme cold. Heavy rains up to 15 inches fell in the Florida Peninsula March 15 to 18, and resulting floods damaged crops, roads, bridges, and houses. In the Far West, temperatures were relatively mild during February and March, precipitation was below normal, except above in the Pacific Northwest, and the mountain snowpack remained well below normal in most sections

APRIL-MAY - The weather of April was mild and rather dry in most of the country, while May was generally cool with heavy precipitation in the northwestern quarter of the Nation and the Pacific Northwest and continued dry weather in most other sections. Wide fluctuations of temperature occurred across the Nation during the 2 months, however. During a sharp cold snap east of the Rocky Mountains the second week of April, lows of 21° at Valley Head, Alabama, on the 10th and at Blairsville Experiment Station, Georgia, on the 11th equaled the lowest temperatures ever recorded in those states for that month, and at the same time a freeze in northern Florida was one of the latest spring freezes there on record. In contrast, temperatures east of the Rocky Mountains rose to midsummer levels during the latter parts of the second and third weeks. In the Far West, unusually cold weather prevailed through the latter half of April and the first week of May, and fruits were heavily damaged in some sections, particularly in Utah and Colorado. In the latter State, the amount and statewide extent of fruit damage caused by freezes on April 17 and 25 and May 6 were among the worst on record, with some fruit crops almost completely destroyed. Rain, snowmelt, and ice jams caused considerable flooding during April in the lower Missouri and upper Mississippi River Basins, and rains caused some flooding in the Northeast and Southeast. Heavy rains also caused some flooding in eastern Texas at the end of April. Heavy rains early in May caused flooding in the east-central Great Plains and in several eastern sections, and late in the month heavy rains caused severe flash floods in Minnesota and eastern Oklahoma. In April, a torando on the 12th killed 3 persons and injured 66 at Sunnyside, Texas; another tornado on the 28th injured 31 persons in Oklahoma City, Oklahoma; a hailstorm on the 26th caused damage estimated at $4 million in San Angelo, Texas; and high winds in the Pacific Northwest on the 13th injured several persons and blew over power and communication lines. In May, numerous tornadoes, particularly in the middle Mississippi Valley and southern Great Plains, caused considerable local damage, and 23 persons were killed by these storms in eastern Oklahoma on the 5th. In much of the Corn Belt cold, wet weather during May hampered planting and at the end of the month barely more than half of the crop was planted, compared with an average of four-fifths for the date.

SUMMER - In the Far West the summer was unusually hot and among the driest on record in many central and southern sections. Extreme summer heat persisted throughout the month of June, with a June high of 95° for downtown San Francisco, California, on the 2d and an alltime high of 109° for El Paso, Texas, on the 21st. This was the hottest June on record at Yuma, Arizona, 92.3°; Bakersfield, California, 83.7°; Las Vegas, Nevada, 87.4; and El Paso, Texas, 85.0°. June 1960 in some parts of the Far West also was among the driest Junes in 10 to 40 years. In the Great Basin, irrigation water was below normal requirements, ranges and nonirrigated crops deteriorated, and a high fire hazard existed. In July, the heat and drought became more intense and extensive. Average temperatures for the month were the highest on record at a number of stations including Boise, Idaho, and Salt Lake City, Utah. Eleven percent of all stations in the Far West reported no rain at all during July. August was somewhat cooler in the Far West, with above-normal precipitation in northern areas. Dry weather persisted in central and southern areas, however, and from about the 21st through the 23d fires in Tahoe and Toiyabe National Forests burned over 35,000 acres. Late in August a cold air mass covered the Far West, reducing temperatures to record-low levels for so early in the season, and heavy early-season snows fell in the mountains of Idaho and western Montana. East of the Rocky Mountains the summer was generally cool and wet. June and July were particularly cool in the northeastern quarter of the country where temperatures were below normal most of the time. At many stations in this area the temperature for the first time in many years failed to rise to 90°. At Milwaukee, Wisconsin, the highest temperature of the month, 81°, was lower in only one June since 1871. Louisville, Kentucky, had its coolest June (60.7°) on record. The coolest July on record was reported by many stations in northern areas, including Wilmington, Delaware; Cleveland, Ohio; and Pittsburgh, Pennsylvania. This was the coolest July at Erie and Philadelphia, Pennsylvania, since 1895; at Milwaukee, Wisconsin, since 1915; and the sixth coolest at Albany, New York, during the past 106 years. Temperatures averaged about normal for August.

Summer precipitation east of the Rocky Mountains was well above normal in parts of the lower Great Plains and lower Mississippi Valley, much below normal in the west central and northwestern Great Plains, and generally within 25 percent of normal elsewhere. During June, record-breaking rains fell in parts of the Ohio Valley and lower Great Plains, and in southeastern Texas torrential rains of 10 to 20 inches in the last week resulted in floods that caused millions of dollars in damage and the drowning of 15 persons. Damaging flash floods occurred in the southwestern Great Plains as a result of heavy rains there again on July 3 to 9 and 21 to 25. Fort Smith, Arkansas, reported a record July fall of over 10 inches, and Clovis, New Mexico, a record July total of over 13 inches. In August, continued heavy rainfall in the lower Great Plains was also both heavy and frequent in the lower Mississippi Valley where rain occurred on 26 days at Baton Rouge, Louisiana, and a total of 16.58 inches at Vicksburg, Mississippi, set a new August record there. Tropical storm Brenda, on July 28 to 30, produced a large portion of the rainfall along the Atlantic coast, with a record 24-hour total of 12.11 inches at Tampa, Florida. Additional heavy thunderstorm rains in Florida boosted monthly totals to new records for July at Lakeland, 15.67 inches; Tampa, 20.59 inches; Orlando, 19.57 inches; and Jacksonville, 16.21 inches. Severe local storms during the summer took the usual toll of lives and property. In June, a tornado caused damage of a few million dollars in the Rotterdam-Schenectady area of New York State on the 24th. In August, storms were blamed for the death of at least 40 persons and more than 100 injuries. On the 3d of August, a seiche in lower Lake Michigan was the first ever forecast by the Weather Bureau; although the Lake level rose 4 to 6 feet in many places, no loss of life occurred.

AUTUMN - Mild temperatures were unusually persistent during the autumn months in most of the Nation. Crops that were planted late in the Corn Belt reached maturity with little or no damage, such as freezing. The weather of September was featured by Hurricane Donna as she crossed the Florida Keys on the 10th, with winds up to 175 m.p.h., in gusts destroying or severely damaging 75 percent of the buildings in that area before curving northward up the southwest coast and passing directly over Fort Myers, where wind gusts up to 121 m.p.h. were recorded. Veering northeastward from Fort Myers the hurricane crossed Florida's main citrus belt, reached the Atlantic between St. Augustine and Daytona Beach on the 11th, and then moved up the Atlantic coast, crossing New England into Canada on the 13th. Donna, one of the most destructive hurricanes ever to reach the United States, left a trail of crop and property damage totaling hundreds of millions of dollars; but owing to accurate and timely warnings, the death toll was slight compared to other lesser storms in the past. Donna produced from about 30 to 50 percent of the September rainfall in the Atlantic Coastal States. Heavy rainfall in southeastern Florida, in addition to that during Donna's passage, was produced by the remnants of tropical storm Florence during the fourth week, boosting the monthly total at Miami to 24.40 inches, a new record there for any month. Ethel, another hurricane which developed in the central Gulf of Mexico on September 14, was the first hurricane ever detected by the Navy MAMOS (Marine Automatic Meteorological Observation Station) a new meteorological instrument. Ethel maintained hurricane intensity only as far north as southeastern Louisiana, but spread heavy rains from the central Gulf area to the central Ohio Valley on the 16th and 17th. These tropical storm rains helped the moisture situation in some southeastern sections. September was very dry in the Ohio Valley, from Iowa to Texas, in the northwestern Great Plains, and in Oregon and California. Rochester, New York, had only 0.28 inch, the least amount there for September since 1830. The first 10 days of September were extremely hot, particularly in the northeastern quarter where many stations recorded their highest temperatures of the year. Chicago, Illinois, had its second warmest September in 89 years, and Los Angeles, California, its warmest month of the year. On the 4th, Spencer, Wyoming, recorded 106°, the highest temperature ever recorded in Wyoming during September, and Roswell, New Mexico, recorded 102° on September 14, the highest there for so late in the season. October weather was featured by heavy rains and extensive floodings in Texas and the lower Great Plains, but the month was extremely dry in the northern Great Plains and in California and the Great Basin of the Far West. Temperatures averaged near normal for the month, with no unusual hot or cold spells. There were relatively few severe local storms. In most areas, October weather was very favorable for the maturity and harvesting of crops. Interesting to note was the fact that snowfall was unusually early at many northern stations during October; Boston, Massachusetts, had a trace on the 24th, the earliest there in 20 years.

Temperatures for November averaged above normal over virtually the entire country, while precipitation varied from unseasonably heavy in the Far West to less than 25 percent of normal in parts of the central and lower Great Plains and Southeast, and below-normal amounts in nearly all areas of the Continental Divide. November was abnormally cool during much of the first half, with a sharp cold snap in the Atlantic Coastal States on the 7th and 8th and another in the midcontinent area from the 9th to 11th, when shallow lakes began to freeze over in the extreme north central Interior and freezing extended to central Texas and Alabama. The second half of November was unusually mild, with late season high temperatures in the northern Great Plains on the 25th and in the Southeast on the 28th. Cold weather returned to much of the Nation the last 3 days of the month, however, with a temperature drop of 34° in 11 hours at Milwaukee, Wisconsin, on the 28th, and a low of -15° at Huron, North Dakota, on the 30th, the lowest temperature there in November since 1897. Heavy November precipitation in the Far West helped replenish soil moisture and water supplies after the prolonged drought, but was only a start in restoring the moisture and water situation to normal. The season's first blizzard occurred in the northern Great Plains on the 28th.

DECEMBER - December weather was cold and stormy as storm systems moved across the eastern half of the country at 4-day intervals and with a lesser frequency in the Far West. Early in the month a Pacific storm lashed California with winds up to hurricane intensity in some areas, and brought the second blizzard within a week to the northern Great Plains and heavy snowfall to the upper Great Lakes region. Additional storms during the second week of December produced heavy snowfall from the Far Southwest to New England, with amounts exceeding a foot in southern

New Mexico, west Texas, and in Atlantic coastal areas from Virginia northward. On the 11th and 12th, a blizzard raged in southeastern New England where 12 to 18 inches of snow, drifted by gale-force winds almost halted normal activities, and was described as one of the worst storms in many years in that region for so early in the season. Floods occurred along many streams in eastern Texas, western Louisiana, and southern Arkansas as a result of heavy rains in that region from the 5th to the 11th. During a cold spell east of the Rocky Mountains from the 13th to the 23d, subzero temperatures extended southward to the Ohio Valley and freezing to southern Texas and south-central Florida. A low of -9° at Louisville, Kentucky, on the 22d was the lowest ever recorded in December since the beginning of records there in 1872. This was among the coldest Decembers on record in the South and East. It was the fourth coldest December on record at Little Rock, Arkansas, and the coldest at Jacksonville, Florida, since 1935. At Richmond, Virginia, this was the only December during 64 years of record that the average daily minimum temperature averaged below 32°. The year ended with a below-normal mountain snow pack in the Far West where the water supply outlook for the 1961 season was very dark.

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Summary of Insect Conditions - 1960

GRASSHOPPERS

During 1960, as during 1959, grasshoppers were generally far less of a problem than they were during the 1958 season. There were some localized infestations in several of the states, however, that did require some controls. Fall grasshopper surveys in NORTH DAKOTA showed infestations to be more widespread than during 1959 and a potential threat to crop production in 1961. Populations were somewhat higher in WISCONSIN during 1960 than in previous years, although injury to forage was minimal. In MINNESOTA, there was a general increase in the grasshopper population over much of the State, being heaviest in west central and southwestern counties. In INDIANA, RED-LEGGED GRASSHOPPER (*Melanoplus femurrubrum*),DIFFERENTIAL GRASSHOPPER (*M. differentialis*) and TWO-STRIPED GRASSHOPPER (*M. bivittatus*) were more abundant than for several years and overall grasshopper populations in OKLAHOMA were heavier during 1960 than those noted in 1959. Grasshopper infestations in ARKANSAS were generally lighter in the western portion of the State than in past years; however, infestations are building up to economic levels in a few "hot spots." No serious grasshopper problems developed in the Panhandle and plains areas of TEXAS during the season; and generally, populations did not reach outbreak proportions during the summer in ARIZONA and NEW MEXICO, although they did become heavy in a few localized areas. Grasshoppers continued on a downward trend in NEBRASKA, with populations at the lowest point in many years in that State as well as in KANSAS. Populations in NEVADA were below economic levels in 1960, with practically no controls being undertaken; however, some controls were applied in localized areas of WYOMING, MONTANA, UTAH, COLORADO and CALIFORNIA although the overall grasshopper population in these 5 latter States was light. For information on the grasshopper adult survey conducted in the late summer and fall of 1960, see the map following page 24 (CEIR 11(2):1-13-61).

Heavy grasshopper infestations in MINNESOTA, although quite common, were localized, somewhat scattered and not found in large contiguous blocks. Most of these heavy infestations were found in, or associated with, soil bank fields seeded to legumes as cover crops. Damage to corn and soybeans adjacent to these fields was heavy in many instances, especially in Swift and Chippewa Counties. Some controls were applied by farmers in the area, mostly to corn and soybeans. However, control was not as effective as it might have been as it was applied after adults had appeared and not directed at the source of the infestations. Reluctance of soil bank landowners to spend money for control was definitely a problem in Minnesota during the 1960 season. Red-legged grasshopper remained the dominant species, but a considerable increase of two-striped and differential grasshoppers occurred in west central counties. Low numbers of differential grasshopper occurred in a number of fields along the western edge of the State. CLEAR-WINGED GRASSHOPPER (Camnula pellucida) was dominant in north central and northeastern Minnesota counties, but infestations were noneconomic. In WISCONSIN, red-legged grasshopper comprised over 90 percent of the grasshopper population. Eggs were first observed coagulating in Rock and Sauk Counties May 13 and due to weather hatching was prolonged to as late as July 29.

Grasshoppers increased in numbers in IOWA over 1959 but only scattered, local areas recorded numbers sufficient to be classified as light. The main species involved was red-legged grasshopper, with fence row infestations of differential grasshopper being present. Melanoplus spp. nymphs began emerging in fields of clover and grass in southern ILLINOIS the first half of May and in the northern area the latter part of May, continuing into July when nymphs, still mostly first instar, varied 20-1,020 (averaged 256) per 100 sweeps in eastern and central sections of the State. Due to heavy rains killing small nymphs, very few second- and third-instar nymphs appeared before July 10. Some migration into corn and soybeans was observed in August. Feeding was noticeable in marginal rows of corn and marginal rows of soybeans required treatment in some eastern fields. An estimated total of 51,928 acres was treated for control in Illinois during 1960. In INDIANA, nymphal development of red-legged, differential and two-striped grasshoppers was successful in lush fence rows, roadsides and field margins. Migrations into croplands occurred in July and August, causing considerable localized damage to corn and soybeans. Adults of MIGRATORY GRASSHOPPER (M. bilituratus) were collected in Vigo County during late June and in Tippecanoe County the first week of July. Differential, red-legged and migratory grasshoppers were damaging in MISSOURI only in the southwest area. Damage occurred during the dry, late summer period and was confined to margins of alfalfa and corn. Grasshopper infestations in ARKANSAS during late spring and early summer were more common than in past years in the eastern area, with field border feeding on cotton and soybeans being of importance.

Differential grasshopper adults became very common in one field of soybeans in Kent County, DELAWARE, during early October and caused moderately heavy injury. Adults were also common in scattered fields of soybeans, generally, throughout the State during October, causing light injury. In southern sections of RHODE ISLAND, nymphs of undetermined grasshopper species became very abundant in alfalfa, and in Rutland and Addison Counties, VERMONT, red-legged and differential grasshoppers caused considerable damage to all forage.

Grasshoppers developed scattered threatening to severe rangeland infestations in southwestern counties and McLeod County, NORTH DAKOTA, with cooperative controls being applied to approximately 4,300 acres. Dominant species included Ageneotettix deorum, Aulocara elliotti, migratory grasshopper and clear-winged grasshopper. Egg hatch was late, extending over a long period, with heat and drought during July appearing to hasten development. Most rangeland populations reached the adult stage by August 1. Fall range surveys showed an area of 130,000 acres with light to moderate grasshopper populations. Moderate to abundant cropland populations occurred in northwestern North Dakota counties, with two-striped, migratory and red-legged grasshoppers dominant; but clear-winged grasshopper was dominant at some locations. Roadside and field margin infestations occurred at scattered southeastern locations. Development was slow in most areas, very similar to that of rangeland species. Ample moisture at start of growing season provided heavy plant growth and grasshopper forage. Heat and drought during July reduced food supply, causing rapid dispersal to crops. Controls were applied to a substantial acreage, especially in northwest sections. In SOUTH DAKOTA, two-striped and migratory grasshoppers began hatching in sandy soil areas of Dewey County the second week of May, at which time eggs were in coagulated to segmented stages in most other areas. During the third week of May, light hatching of these two species began in the southeast corner of the State, as well as in much of the north central and central areas. Hatching was very slow during 1960, the main hatch coming after first cutting of alfalfa. In late June, hatching progressed rapidly in range and croplands. The Elk Mountain range in the Black Hills had a high population that continued through the season, A. elliotti being the dominant species. Infestations were very spotted in South Dakota during the 1960 season.

There are no known large areas of grasshopper infestation in NEBRASKA and all known areas are light, small, and widely scattered. The statewide reduction in populations is probably due to cool temperatures and above-normal rainfall during the hatching period over the most troublesome areas and to winter drought conditions in the panhandle area. The chief problem areas in Nebraska during 1960 were idle lands and legumes, where dominant species were two-striped, differential and migratory grasshoppers. A noticeable increase in red-legged grasshopper was evidenced in legumes in eastern portions of the State. Range areas did not afford any problem in Nebraska during 1960; dominant species were Ageneottix deorum, Aulocara elliotti, Phlibostroma quadrimaculatum and Trachyrhachis kiowa. In KANSAS, there were no cooperative control programs, and dominant crop species were migratory, two-striped and differential grasshoppers. Early instar nymphs appeared in northeast OKLAHOMA by late April and in the northwest by early May. Spring nymphal surveys showed heaviest populations of 15-25 per square yard to be limited to small, isolated range and soil bank land acreages along the Beaver and Cimarron Rivers in Cimarron, Beaver, Harper and Woods Counties. During late spring and early summer, medium to heavy infestations of 7-12 per square yard occurred on crop and rangelands in isolated areas of Stephens, Comanche, Kiowa and Kingfisher Counties. Infestations over most of the remainder of Oklahoma were noneconomic to light, with only isolated marginal damage. Some marginal damage to small grain (averaged 3.5 feet in 15 percent of panhandle area fields) in western half of State was noted in early fall, but was limited mainly to areas with heaviest nymphal infestations during the spring survey. Dominant species were differential grasshopper, two-striped grasshopper, migratory grasshopper, PACKARD GRASSHOPPER (Melanoplus packardii) and Mermiria maculipennis. Aeoloplides turnbulli was the dominant species on soil bank lands in a complex including Melanoplus occidentalis, two-striped grasshopper, migratory grasshopper and Packard grasshopper in TEXAS. Some heavy damage occurred to pastures and crops in west central and central areas, with differential grasshopper the main species. Grasshoppers severely damaged crops on Indian lands in Bernalillo County, NEW MEXICO, with losses of 50-100 percent in the area, and caused light to heavy damage to winter wheat in Curry, Quay and Roosevelt Counties. Moderate to heavy damage occurred in alfalfa in Valencia County. Eggs of migratory grasshopper, Melanoplus cuneatus and Aulocara elliotti began hatching in eastern rangeland areas of ARIZONA, March 20-23, which was about 2 weeks later than in 1959, but near average for all years.

Grasshoppers caused crop and range losses in UTAH estimated at $820,000, controls resulting in a saving of an estimated $780,000. Control applied to croplands was largely by landowners. In Sanpete County, controls were applied to 8,924 acres of pasture and croplands against clear-winged grasshopper. The most damaging species in Utah during 1960 were migratory grasshopper, two-striped grasshopper, red-legged grasshopper, Packard grasshopper, Melanoplus bruneri, clear-winged grasshopper and Aulocara elliotti. Treatments applied to forest and rangelands controlled grasshoppers over a 1,500-acre area in Iron and Garfield Counties. Less than 100,000 acres of COLORADO rangeland had damaging grasshopper populations during 1960; of this, 10,000 acres were treated by landowners. The grasshopper population is expected to be light in the State in 1961, with a moderate buildup in those areas infested during 1960. Melanoplus spp. caused light losses to wheat in west and southwest areas of the State. Light infestations occurred in WYOMING during 1960, with controlled acreage being much smaller than in 1959. Controls were applied to a total of 7,274 acres in Hot Springs, Park, Sheridan and Johnson Counties. Voluntary controls were applied to a total of 1,535 acres of cropland in Goshen, Platte and Sheridan Counties. Few areas of MONTANA required grasshopper controls during 1960. An infestation of mixed species occurred in Dawson County and pockets of Aulocara elliotti were present on Blaine County ranges. Some control to protect grain was carried out and some range was treated on the Crow Indian Reservation.

Approximately 8,000 acres showed light infestations of clear-winged grasshopper, migratory grasshopper and Trimerotropis pallidipennis in Clark, Elko, Esmeralda, Douglas, Humboldt, Lincoln, Nye and Washoe Counties, NEVADA, during the 1960 adult survey. A heavy infestation of Packard grasshopper developed in OREGON on an area 4 miles wide and 20 miles long near Ordnance, Umatilla County. Threatening populations of red-legged grasshopper exist in Washington and Columbia Counties, but damage was noneconomic during 1960. In CALIFORNIA, Melanoplus spp. and Camnula sp. were the principal species involved. Populations did not develop as indicated by early surveys and movement into cultivated areas was exceptional and very local. Rangelands suffered some damage and treatments were applied in local areas of the State. The only major outbreak was in the Coahuila Reservation, Riverside County, where some 4,000 acres were treated. The most numerous grasshopper in ALASKA during the 1960 season was migratory grasshopper and there was a new distribution record for Chorthippus longicornis at Eagle.

MORMON CRICKET (Anabrus simplex) populations built up in the Arlington area of Gilliam County, OREGON, June 20-21, where strip baiting on 1,200 acres effectively controlled infestations on 2,400 acres. Mormon cricket populations were below economic levels in NEVADA and no control programs were undertaken. Adult surveys for 1960 indicated approximately 30,000 acres in Elko, Eureka, Humboldt, Lander, Pershing and Washoe Counties could require control if conditions are favorable for nymphal development in 1961. Although Mormon cricket was present in several UTAH counties during 1960, there was no control program. In WYOMING, a total of 2,665 acres was baited in Sublette County during the year for control of this pest. An infestation of Mormon cricket occurred in Sanders County, MONTANA, but populations were low in other areas of the State.

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CEREAL AND FORAGE INSECTS

Corn and Sorghum Insects: The spread of EUROPEAN CORN BORER (Pyrausta nubilalis) during 1960 was very limited, with a total of only 6 new counties being reported from GEORGIA, NORTH CAROLINA and VIRGINIA. The new counties were as follows: Bath County, Virginia; Union County, North Carolina; and Habersham, Towns, Union and White Counties, Georgia. This is a considerable decrease from the 13 new counties reported during 1959 and the 58 new counties and parishes reported during 1958. The find in Bath County, Virginia, now makes the distribution general in that State. Reports of special surveys conducted in NEW MEXICO, TEXAS and WYOMING were all negative. Fall population levels of European corn borer were generally higher in the Central States than they were during 1959, with increases being most notable in IOWA, WISCONSIN, MINNESOTA, NORTH DAKOTA and SOUTH DAKOTA. In the Eastern States, populations were higher than those encountered in 1959 in MARYLAND, PENNSYLVANIA and WEST VIRGINIA, but were lower in DELAWARE and NEW JERSEY. For all states reporting (except New Jersey) and based upon comparable areas surveyed, the average number of borers per 100 plants increased from 86 in 1959 to 129 in 1960. The average for the Central States was 133 in 1960 compared with 67 in 1959, and in the Eastern States of Delaware, Maryland, Pennsylvania and West Virginia, the average was 136 in 1960 compared with 148 in 1959. (See CEIR 10(53):1156-1165).

The European corn borer fall abundance survey in NORTH DAKOTA showed an average of 474 borers per 100 plants in Cass and Richland Counties, the highest overwintering population ever recorded in the State. Mortality of the 1959 overwintering populations was estimated to be 50 percent. Pupation was complete by June 27, moth emergence began the week of July 19 and egg laying peaked the week of July 11. Shot-hole symptoms appeared in North Dakota about July 19, with an average of 59 percent of plants infested, with 236 borers per 100 plants. By August 1, infestation averaged 68 percent, with numerous fields showing 100 percent of plants infested. Stalk breakage was evident in many fields at harvest. Many communities in the Red River Valley of North Dakota reported severe infestations in sweet corn. Spring surveys in SOUTH DAKOTA indicated a winter survival of approximately 39 percent for the 20 counties surveyed and pupation began the second week in June. The first-brood population was moderate but the second-brood population was high, being much heavier than in 1959. Fall survey showed an average of 66 percent of plants infested, with an average of 172 borers per 100 plants for the 42 counties surveyed.

Overwintering mortality of European corn borer in MINNESOTA averaged 41 percent. Corn planting was delayed over much of the State because of adverse weather which put borer development ahead of corn, resulting in first-generation moths concentrating egg laying on more advanced corn. The first generation was light, except in southwestern Minnesota. Second-generation pupation was late and extended over many weeks, with a long, mild fall allowing many borers to mature. The fall European corn borer abundance survey showed a population increase in all districts, with a State average (based on the average of all stops) of 92 borers per 100 plants. Pupation of overwintering European corn borer began the last week of May in southern WISCONSIN, adults being taken the first week of June. Eggs were first observed in Crawford County in mid-June, averaging 2 per 100 plants. Late corn planting made such observations infrequent for the first generation and subsequent leaf-feeding injury was minor in importance. Second-generation infestation in Wisconsin was much higher, with a State average being 93 borers per 100 plants. In MICHIGAN, sweet corn gross returns were down $200 per acre on 15,000 acres, or $3,000,000, as a result of European corn borer. The total loss to field corn was estimated at $379,000 as damage was confined largely to early planted corn. In IOWA, the European corn borer overwintering population averaged 726 borers per acre of corn debris in oatfields in 1960, compared with 3,049 in 1959. Pupation was 92 percent at Ankeny on May 27 and moths began flying at Ames on May 31. Emergence was 84 percent at Ankeny the week ending June 10, with first egg masses found June 6. First eggs were found on sweet corn at Muscatine, June 9. Heavy egg laying occurred the week ending June 17. First-brood survival was much greater in 1960 than in 1959, the State average being 41 percent of plants infested, with an average of 66 borers per 100 plants. The second brood was considerably larger in 1960 than in 1959. The fall survey indicated a higher population of overwintering larvae than for 1959. However, with this increase, the borer population was still relatively low. The State average was 124 borers per 100 plants for 1960 compared with 50 borers per 100 plants in 1959.

The intensive European corn borer spring survey in Hall and Cuming Counties, NEBRASKA, revealed a heavy winter mortality of 94.5 and 98.8 percent, respectively. Populations per acre were 346 in Hall County and 1,429 in Cuming County. Pupation of overwintering borers peaked the first week of June, with moths being collected June 1 at North Platte and June 4 at Lincoln. In some areas, 75 percent of first-brood European corn borer pupated by July 29. Surveys in Hall and Cuming Counties during July showed 4,955 and 8,684 borers per acre, respectively, which were approximately double that of 1959, while fall surveys showed 32,181 borers per acre in Hall County and 28,624 in Cuming County. The fall abundance survey in 63 corn-producing Nebraska counties showed 14-100 percent of corn plants infested, with 7-575 (average 119) borers per 100 plants, and that population numbers were slightly higher than in 1959. European corn borer infestations in KANSAS were about the same as during 1959 and were not of great economic importance. European corn borer populations were low again in MISSOURI during 1960. Counts of plants showing first-brood leaf feeding scars ranged 10-65 percent. As this is below the 75 percent recommended for treatment, very little control work was done. A few fields in the southeast portion of the State were damaged by second-brood and third-brood borers. The fall European corn borer population in Missouri was up from 36 borers per 100 stalks in 1959 to 61 in 1960. The southeast district was the high district during 1960 with 154 borers per 100 stalks.

The 1959-1960 winter survival of European corn borer was 66.7 percent in ILLINOIS. Due to wet spring weather, most corn planting was delayed, moth emergence and egg laying being ahead of corn development with only 2-5 percent of corn being large enough for good borer survival. This resulted in many eggs being laid on corn too small. Less than 50 percent of first-generation European corn borer larvae pupated, reducing the second-generation potential further. Because of the large amount of late corn the second generation was distributed through many fields, reducing the possibility of serious damage to some fields. However, both first- and second-generation populations were greater in 1960 than in 1959. The Illinois state averages for borers per 100 plants in 1959 were 4.32 for the first generation and 79 for the second generation, while corresponding figures for 1960 were 8.80 and 98. An estimated 83,274 acres of corn were treated in Illinois during the 1960 season. In INDIANA, June and August European corn borer moth generations were more abundant than in 1959. Late sweet corn had 60 percent of stalks infested in the central area. Generally, infestations and populations appeared higher than during 1959, particularly in the northern section of Indiana and in the counties in the southwest. One field of white corn in Posey County averaged more than 2 borers per plant, with about 96 percent infestation.

First-generation European corn borer damage in MARYLAND again ranged moderate to heavy in early planted sweet and field corn on the Eastern Shore and in Carroll and Harford Counties. Second-generation infestations were generally light in all sections. The fall population survey showed the Maryland average to be 136 European corn borer larvae per 100 cornstalks, the second highest on record. The average for the 9 Eastern Shore counties was 209 borers per 100 stalks. In DELAWARE, the 1960 spring abundance survey for European corn borer showed a 42 percent survival of overwintering live borers, which was approximately 30 percent higher than in the spring of 1959. However, the 1960 fall abundance survey indicated a decrease in infested corn and the borer population in Delaware this season over the previous year's State averages. In the State average of percent of plants infested, the drop from 80.7 in 1959 to 64.7 in 1960 represents a 20-percent reduction in infested corn. The Delaware State average of 262 borers per 100 plants represents a 33-percent decrease in the 1960 fall European corn borer population in corn as compared with 394 for 1959. However, this is still a very high borer population. European corn borer surveys in PENNSYLVANIA showed the borer count to be higher than in 1959, but most damage was masked by good growing weather. The fall survey in NEW JERSEY showed slight increases in populations in Cumberland, Salem and Warren Counties, but decreases in the other 8 counties surveyed. The State average per 100 plants was 183 compared with 270 in 1959. European corn borer was moderate in most areas of CONNECTICUT, with some heavy infestations in spots, and in NEW HAMPSHIRE European corn borer was somewhat more prevalent on sweet corn during 1960 than in 1959. Eggs hatched July 9 in the central portion of MAINE, infestations were generally light in untreated corn in the southern part of the State by early August, while infestations and damage were moderate on untreated corn in the central portion of the State by August 20.

The European corn borer infestation was one of the highest on record in VIRGINIA, with larvae heavily damaging corn in all areas. The 1960 fall abundance survey in 4 southwestern and 4 northern counties showed an average of 147 borers per 100 stalks, 58 percent infested, in the southwest and 236 borers per 100 stalks, 83 percent infested, in the north. In NORTH CAROLINA, European corn borer averaged slightly less than 1 per stalk in Pasquotank County, which is higher than observed for past 3 years. Populations were slightly lower in Beaufort, Pamlico and Camden Counties. Pupation was 10-30 percent complete April 4-7 (a few days later than in 1959); first adults emerged April 25 at Elizabeth City and April 27 at Aurora (4 days later than in 1959). Again in 1960, infestations of European corn borer overwintering in corn were most easily found in locations where the commercial potato crops are of greatest density. In GEORGIA, infestations of European corn borer were of greater importance than during 1959, being found in the previously mentioned counties for the first time. Seasonal surveys in LOUISIANA revealed no further spread of European corn borer and infestations were found to be inconsequential.

The annual survey for European corn borer in ARKANSAS showed that early corn had very light infestations, while late corn was heavily infested. Year-to-year comparisons are made difficult by this fact; however, overall infestations were very similar to previous years. In OKLAHOMA, European corn borer continued at a noneconomic level in infested fields during 1960.

CORN EARWORM (*Heliothis zea*) populations and damage were variable over the Nation during 1960, being less numerous and not as damaging as in 1959, generally, in several states. Although moth flights were not as heavy in INDIANA as in 1959, larval infestations in sweet corn were heavy. Corn was in a favorable condition to attract moths, thus absorbed a bulk of the population. Some plantings of early and late-planted corn were 100 percent infested. Because of the spotty occurrences of corn earworm in southern portions of Indiana, total damage will be about equal to that of 1959, with fall damage being especially heavy. Corn earworm damage to field corn in ILLINOIS was very light during 1960. Larvae averaged 114 per 100 ears in untreated sweet corn in the southwest area the week of July 3. Few corn earworm eggs were observed in central area by August 7, but could be found throughout southern and central sections by August 14; none were found in northern area at this time. First corn earworm adults caught in WISCONSIN during 1960 were one in a blacklight trap at Green Bay on June 16 and another at Arlington on July 15. Significant numbers did not appear in light traps until the last week in August, approximately 2 months later than in 1959. Larval injury, accordingly, was too late to cause significant injury to field corn and only minor injury to sweet corn.

Corn earworm populations were low in corn in MISSOURI during 1960. Some budworm feeding was evident in the southwest at mid-June. From late June to mid-July, 6-15 percent of late corn was infested in the whorl. Few larvae fed on late corn in northwest area. Damage to sorghum appeared in mid-August in southwest and southeast areas, with 4-20 larvae per 100 heads. In September, counts in late-planted sorghum ranged 12-100 larvae per 100 heads statewide. These populations, along with high populations of sorghum webworm (*Celama sorghiella*), caused extensive damage to late-planted sorghum in southwest, southeast and central areas of Missouri. In ARKANSAS, declining acreage has influenced the importance of sorghum pests in the State. Corn earworm, sorghum webworm and sorghum midge (*Contarinia sorghicola*) were the important pests during 1960. Late sorghum suffered minor economic damage, while early sorghum was practically free of insect pests in Arkansas during 1960. In KANSAS, corn earworm caused usual damage to corn and very light damage to grain sorghum heads. Corn earworm damage to field corn in NEBRASKA was light to moderate in southeast, south and eastern crop districts beginning in late July. Heaviest damage occurred in the southeast, where scattered damage reached 60-80 percent. In COLORADO, corn earworm losses to dryland and irrigated shell corn were low in the eastern portion of the State and about average in the western part. There was also some loss to sweet corn. Corn earworm caused light to moderate damage to corn in northern UTAH, but was more damaging in the southern portion. Damage was usually light on early market and canning corn, especially in northern and central canning areas of the State. Corn earworm populations were heavy, as usual, in eastern OREGON corn plantings, but reached an unusual high of 60 percent of ears infested in Polk County and 40 percent in Lane County by early September. In CALIFORNIA, light populations of corn earworm developed early but remained static until early summer when severe damage began and continued until December. All corn and bean growing areas were affected.

Corn earworm populations over OKLAHOMA were generally lighter during 1960 than recorded for 1958 and 1959. Only light damage was noted in early corn and in grain sorghum. Localized, damaging infestations occurred in later-planted fields of these 2 crops in September in the eastern portion of the State. Corn earworm infestations in TEXAS damaged corn and grain sorghum in all areas where these crops were grown during 1960. In LOUISIANA, corn earworm infestations in field corn were about the same as those occurring during 1959. Also, 85-100 percent of the sweet corn examined in southern half of Louisiana was infested. Infestations were moderate to heavy on whorls of corn in GEORGIA about June 1 and heavy infestations also occurred on sweet corn.

Unusual corn earworm infestations occurred in ears of sweet corn in the Coastal Plain and Piedmont areas of NORTH CAROLINA during 1960; and infestations caused damage to corn statewide in VIRGINIA, especially to buds of field corn, during midsummer. There was also considerable damage to sorghum in Virginia. However, timely application of controls in this State reduced severity from that anticipated and the pest was considered less severe than during 1959. Corn earworm infestations in early and late corn in MARYLAND were slightly below normal and not as heavy in DELAWARE field corn as in 1959, with most severe infestations occurring during August and early September. Though spotty in CONNECTICUT, corn earworm was heavy in some very localized areas, but was less abundant in NEW HAMPSHIRE than during 1959. However, the pest caused severe injury to untreated corn in southern and central areas of MAINE during August and some injury (approximately 10 percent) occurred in plantings in Cumberland County, which had been treated twice.

ARMYWORMS were generally not a problem in corn and sorghum during the 1960 season. Infestations of FALL ARMYWORM (Laphygma frugiperda) in late-planted field corn in INDIANA were reported in localized areas of several south central counties and were widely scattered throughout ILLINOIS on late corn, with a few damaging infestations reported in mid-August. Fall armyworm caused some damage to corn and grain sorghum in KANSAS by feeding on ears and grain heads in the eastern portion of the State. Light damage by this pest was noted in corn and grain sorghum throughout OKLAHOMA during July and August, while loss to dryland and irrigated shell corn was low in eastern COLORADO and about average in the western area of that State. Fall armyworm also contributed to losses occurring on sweet corn in Colorado. Fall armyworm was only a local problem in ARIZONA on corn and sorghum.

Fall armyworm infestations in LOUISIANA averaged approximately 25 percent in corn and caused much damage to millet. Infestations ranged moderate to heavy in whorls of corn in GEORGIA about June 1 and light to heavy in millet and grain sorghum. Fall armyworm caused local injury to millet and sorghum cane in many areas of NORTH CAROLINA. Populations in corn were considerably below normal in MARYLAND during 1960, with heaviest numbers noted in Frederick County during August. In MAINE, fall armyworm caused light damage to corn in coastal areas.

ARMYWORM (Pseudaletia unipuncta) was serious through June in SOUTH DAKOTA, averaging as high as 3 larvae per linear foot in corn in some localities. In MINNESOTA, sweet and field corn were severely damaged or destroyed in isolated localities; and adults were taken in large numbers in blacklight traps in WISCONSIN, although larval infestations were insignificant. In DELAWARE, the first larvae of the season were found on corn and clover in New Castle County and in a blacklight trap in Sussex County in late April. Larvae were present in all areas of the State throughout the season, with light injury to corn. Armyworm was more prevalent than usual in CALIFORNIA, causing considerable damage to corn over the State.

Unspecified species of ARMYWORMS caused some damage to marginal rows of corn when adjacent grass or grain was cut in ILLINOIS. Of the 2 economic infestations of undetermined armyworms reported in NORTH DAKOTA during the 1960 season, one was in corn near Killdeer, Dunn County.

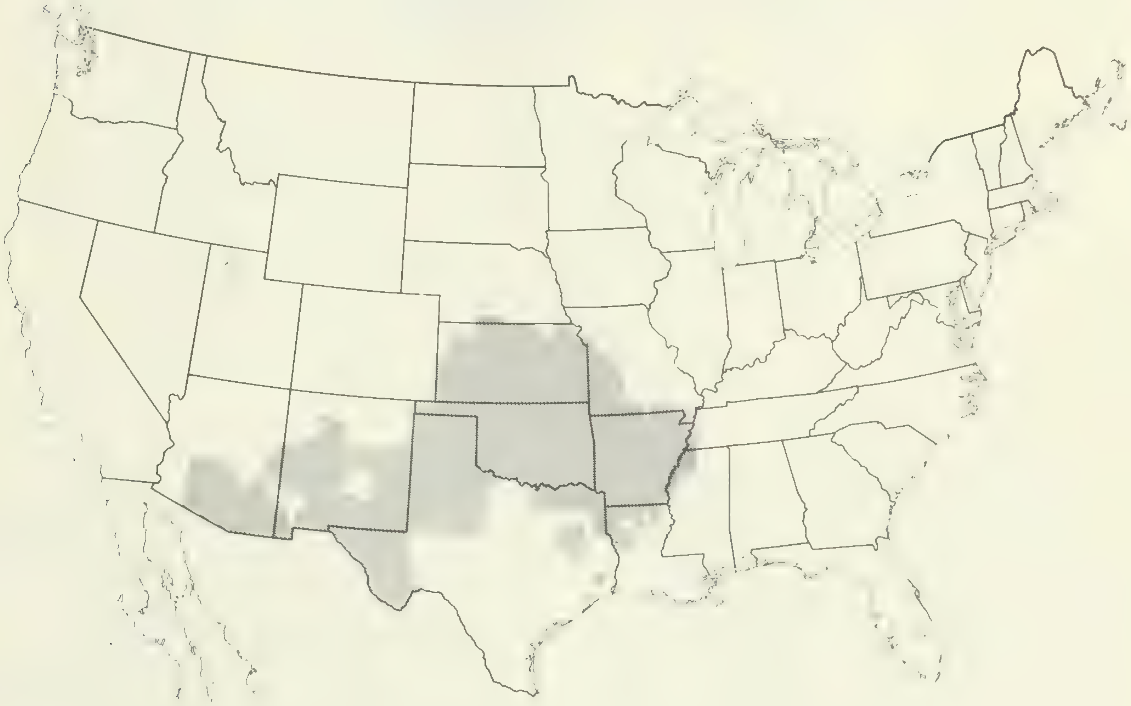
Several species of CUTWORMS were of concern in corn during the 1960 season and caused some damage. BLACK CUTWORM (Agrotis ipsilon) damaged corn in several localities of VIRGINIA in late June; and cool, wet weather during June apparently favored a general outbreak of this pest on young sweet and field corn in all sections of MARYLAND, where injury was serious in over 50 fields. Several species of cutworms were common during the spring months in INDIANA, causing losses to corn, with black cutworm the dominant species. In ILLINOIS, various species of cutworms damaged up to 40 percent of corn plants in a few fields in the southern area during late May. By mid-June, black cutworm, with a few DINGY CUTWORM (Feltia subgothica), were damaging corn statewide, 15-20 percent damage being common. Much treating and replanting was taking place at this time. Some

VARIEGATED CUTWORM (Peridroma saucia) were also present and one field in the northwest area of Illinois was damaged by Euxoa sp. An estimated 109,479 acres were treated and 115,294 acres replanted due to cutworms. Black cutworm caused a serious, but localized, outbreak in the Mazomanie area of Dane County, WISCONSIN, about June 10, and cutworm damage to corn in MISSOURI was first reported in late May in the northwest area. From mid to late June, corn throughout the northern half of Missouri was severely damaged. In late June and early July, larvae of dingy cutworm matured but damage from black cutworm was still evident in wet spots of north central and northeast Missouri. An estimated 200,000 acres of corn in the State had to be replanted because of soil insect damage, with a majority of this replanting caused by cutworms. Cutworm damage up to 50 percent, caused by undetermined species, was noted in fields of corn in eastern third of NEBRASKA during June, with damage primarily limited to plants less than 5 inches high. Larvae of WESTERN BEAN CUTWORM (Loxostege albicosta) were collected for the first time in field corn in Lincoln County, Nebraska, in mid-August. Some fields in Dundy, Chase and Perkins Counties had 100 percent of ears infested with 3-4 larvae the first half of September. Moths reached high counts in North Platte and Scotts Bluff light traps August 1. Several species of cutworms were a problem on corn and grain sorghum in local areas of ARIZONA and damaged corn plantings in the mid-Willamette Valley of OREGON during July.

STALK BORER (Papaipema nebris) caused a limited degree of damage in OKLAHOMA during 1960 and a very minor amount of damage to corn in eastern KANSAS. Light infestations were noted in marginal rows of corn in southwest MISSOURI in mid-June and some very light infestations were observed along fence rows in central NEBRASKA. Stalk borer was more abundant than usual in ILLINOIS, damaging marginal rows of corn adjacent to grass, weeds and small grains. In early July, one out of 16 fields of corn in eastern and central sections of Illinois had 100 percent of plants damaged in first 3 marginal rows, with 0-5 borers per plant. Stalk borer was also more prevalent in INDIANA than during 1959. Larvae damaged early planted corn, with infestations being more common along weedy fence rows.

SORGHUM WEBWORM (Celama sorghiella) populations were heavy in many areas of TEXAS on grain sorghum, but not as heavy as in 1959. There was considerable damage to late grain sorghum in the State. Sorghum webworm infestations were considerably lighter in OKLAHOMA than those encountered during 1959 and equal to, or somewhat lighter than, recorded for 1958. Only limited numbers of late-planted fields in east central and northeastern Oklahoma were found with medium infestations of 40-50 per head. There was apparently little or no damage to early planted and/or "loose-headed" sorghum. Sorghum webworm caused some damage to late-maturing grain sorghum in southeast KANSAS; however, damage was not as severe nor over as large an area as in 1959. The first generation of sorghum webworm was completed in early August in the southern portion of MISSOURI. Mature larvae and pupae ranged 0-30 per 100 heads. Populations continued to build up through August and by early September ranged 3-35 per head in the southwest and 3-12 in the north central area. By the end of September, late-planted sorghum throughout Missouri was being damaged, being most severe in the southwest where larval counts ranged 6-55 per head. Sorghum webworm was observed in sorghum heads as far north in INDIANA as Winchester in Randolph County, but no severe infestations were reported during 1960.

Light trap data indicated the first heavy SOUTHWESTERN CORN BORER (Zeadiatraea grandiosella) moth emergence in central ARIZONA occurred in mid-May. Field infestations were slow to develop and were generally light throughout the summer. Counts in July showed an average of 10-25 percent of stalks infested in central and southeastern area corn and sorghum. The pest does not occur in Yuma County. In NEW MEXICO, southwestern corn borer was found to be very abundant in stalks of corn during the European corn borer survey conducted in October. An occasional specimen was also found in grain sorghums and broomcorn. Southwestern corn borer was widespread in northeastern TEXAS with average infestations ranging 40-90 percent. The pest was collected in Jackson Parish, LOUISIANA, during 1960, for a new parish record. Southwestern corn borer infestations were much more serious in ARKANSAS in late corn than in early corn. For the first time, a survey was made in 95 fields in 19 counties, showing that an average of 5.8 percent of corn lodged was a result of infestations of this pest. Infestations of southwestern corn borer were somewhat higher throughout OKLAHOMA during 1960 than those noted during the 1959 season, and the pest was generally not of economic importance in KANSAS. Checks of several fields of corn in southwest MISSOURI showed an overwintering survival of 7 percent for southwestern corn borer. A light, first-brood infestation occurred in June and early July. The 1960 survey in Missouri showed a higher percent of girdled stalks than for the past several years. Southwestern corn borer infested corn in TENNESSEE and was found in Shelby and Tipton Counties for the first time during 1960.



Distribution of Southwestern Corn Borer

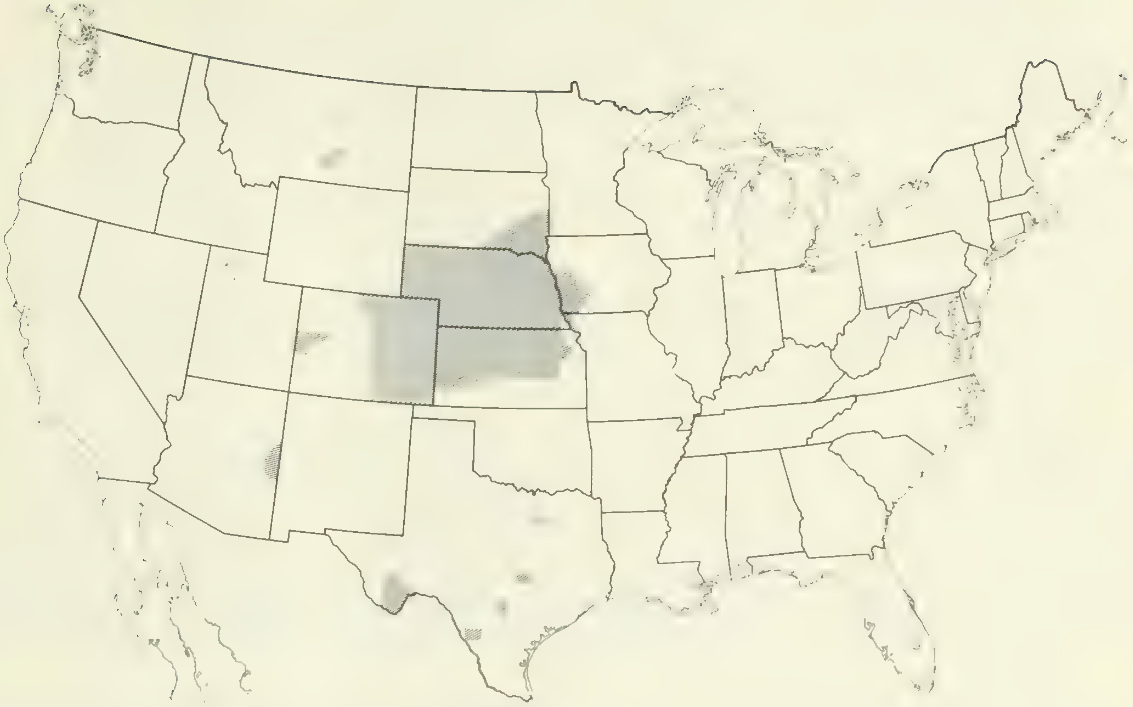
Summer and winter larval forms of SOUTHERN CORNSTALK BORER (Diatraea crambidoides) infested many fields of corn in Sussex County, DELAWARE, during September; and infestations of this pest were moderate in field corn on the lower Eastern Shore of MARYLAND. CORN ROOT WEBWORM (Crambus caliginosellus) seriously injured young corn at localities in Kent, Queen Annes and Talbot Counties, Maryland. SUGARCANE BORER (Diatraea saccharalis) populations were extremely heavy in late grain sorghum in the Brazos River area of TEXAS, with somewhat less damage noted on corn and grain sorghum in the coastal area of that State and infestations of sugarcane borer in corn were light in LOUISIANA. Light infestations of LESSER CORNSTALK BORER (Elasmopalpus lignosellus) appeared in central and southwest ARIZONA on young corn and sorghum during June, remaining light in most cases and with damage generally lighter than during previous years. Lesser cornstalk borer was not a problem on corn in LOUISIANA, except for some minor damage to a field in East Feliciana Parish. A PYRAUSTID (Nomophila noctuella), which was of economic importance on corn in areas of INDIANA during 1959, was not of importance during the 1960 season.

CORN ROOTWORMS (*Diabrotica* spp.) were again of importance in corn in several of the corn-producing states. Three species, NORTHERN CORN ROOTWORM (*D. longicornis*), SOUTHERN CORN ROOTWORM (*D. undecimpunctata howardi*) and WESTERN CORN ROOTWORM (*D. virgifera*) were present in NEBRASKA and caused the greatest concern of all other insects during 1960. Reports of larval damage began in July and continued into August. Controls against these pests failed in many cases. Areas in Nebraska showing greatest damage were irrigated lands and river valleys (especially the Platte River Valley). Of the 3 species, western corn rootworm was dominant, accounting for 63 percent of the adult population during 1960 as compared with 40 percent in 1948. Western corn rootworm was dominant in most areas except in the northeastern crop district where northern corn rootworm was more prevalent. Western corn rootworm used corn as its primary host, whereas northern and southern corn rootworm adults migrated to milo and alfalfa in late summer. In KANSAS, northern, southern and western corn rootworms caused extensive lodging of corn plants in north central and northeastern areas of the State, with more damage noted during 1960 than during any year since 1953.

Northern corn rootworm caused considerable damage to corn ears in September in east central SOUTH DAKOTA, and will require close observation during 1961. Damage to corn in MINNESOTA by northern corn rootworm was quite evident during 1960, with this pest becoming more of a problem each year. High populations occurred in the southern third of the State and the use of soil insecticides for control has increased, especially in extreme southern counties. First larval attack by northern corn rootworm in WISCONSIN was noted in Columbia County July 8. Adults were taken in blacklight traps in the southern area of the State from the first of August to September 23, and corn silks in southern counties had heavy adult concentrations during the first weeks of August. Adults were observed as far north as Winnebago and Trempealeau Counties. Northern corn rootworm was quite abundant in many fields of corn in northern INDIANA during 1960. Larval feeding on corn roots was rather general, although few reports of stalk lodging were received. Adults feeding on corn silks were abundant enough in Jasper, Newton and Benton Counties to be of concern to hybrid seed corn producers. Larval damage by northern corn rootworm in MISSOURI was evident in major corn-producing areas throughout the State. Yields in infested areas were reduced 10-15 percent in northern half of the State and 5-10 percent in central and southeast areas. From mid-August to mid-September adult populations were heavy on corn fresh with silks. Adults ranged 2-8 per ear in northwest and 4-19 in central Missouri. One field in the central area had 30 adults feeding on silks during pollination. In TENNESSEE, northern corn rootworm persisted in bottomlands continuously planted to corn in the drainage area of the western arm of the Tennessee River. Approximately 15,000 acres were treated to prevent possible yield loss by adult feeding on ear silks. This was an emergency measure resulting from lack of positive information concerning the number of adults per corn ear versus potential losses resulting therefrom.

Western corn rootworm was collected for the first time in MISSOURI during 1960, being taken in Holt and Atchison Counties; and the pest was collected for the first time in Humboldt and Adair Counties, IOWA, in 1960. Western corn rootworm caused considerable loss in COLORADO to dryland and irrigated shell corn, with larvae feeding on roots and as adults feeding on stalks and leaves. The pest also infested corn for silage. Western corn rootworm adult populations were numerous in many fields of corn in southeastern WYOMING. The species was first reported August 5 and populations increased until mid-September. Smaller numbers of adults could still be found the first of October in Wyoming.

Adults of southern corn rootworm were commonly found feeding on corn throughout ILLINOIS by mid-June. Adults averaged 10 per 100 corn plants the week of June 12, and 22 percent of all corn plants in west-southwest Illinois showed signs of feeding. Southern corn rootworm was responsible for limited damage in OKLAHOMA during 1960, but severely damaged several fields of corn in East Feliciana and Tensas Parishes, LOUISIANA, in the spring. Southern corn rootworm adults were general, statewide, in DELAWARE throughout the growing season on corn but caused only light injury.



Distribution of Western Corn Rootworm

Adult populations of CORN FLEA BEETLE (Chaetocnema pulicaria) varied 2-6 per plant in early corn in southern ILLINOIS by May 15 and were as high as 12 per plant in the East St. Louis area, with some fields being treated the week of May 22. Populations averaged 42 adults per 100 plants in field corn in the west-southwest section of the State by June 12. Small, localized numbers of corn flea beetle were observed in a few fields of corn in counties in central and southeastern NEBRASKA during June, and the pest was generally not of economic importance in KANSAS during 1960. Corn flea beetle infestations in OKLAHOMA were noneconomic to generally light (0-2 per plant) in corn and grain sorghum from late May through September in the eastern half of the State. Medium to locally heavy populations were limited to isolated fields in south central and east central areas and there was little change noted from the overall corn flea beetle populations recorded during 1959. Corn flea beetle was mostly light on corn and grain sorghum in north central TEXAS during 1960. In UTAH, corn flea beetle again damaged sweet and field corn throughout the season in Washington County and less commonly elsewhere in the State. Corn flea beetle numbers on sweet and field corn in MARYLAND were slightly above normal and adults were first noted on young corn in Sussex County, DELAWARE, in late April, becoming fairly abundant by mid-May. Feeding injury was heavy when corn was young, but generally was light during most of the season in Delaware.

DESERT CORN FLEA BEETLE (Chaetocnema ectypa) infestations in ARIZONA were light to medium on central and southwest area corn and sorghum during April, May and June, with damage light in most cases.

Larvae of CHRYSOMELIDS (Maecolaspis spp.) damaged 50 percent of corn plants in an Edgar County, ILLINOIS, field in early June, with an average of 10 per damaged plant. A survey in the west-southwest section of the State showed 0-8 percent of plants damaged, with 0-3 larvae and pupae per damaged plant in mid-June. In NORTH CAROLINA, an average of one adult per ear attacked sweet corn in Duplin County during mid-July.

Adults of DUSKY SAP BEETLE (*Carpophilus lugubris*) infested corn in DELAWARE during late May, increasing in numbers throughout the State all season, with larval and adult infestations being particularly heavy in Sussex County from late July through mid-August. Dusky sap beetle attacked ears of sweet corn in the Coastal Plain and Piedmont areas of NORTH CAROLINA and infested sweet corn in East St. Louis area of ILLINOIS in late June and early July. In UTAH, dusky sap beetle caused injury to ears of sweet corn as far north as Salt Lake and Utah Counties, mostly in home gardens. Damage from this pest was most common and most severe in the southern portion of the State. Unspecified species of SAP BEETLES were again abundant in ears of sweet and field corn in all sections of MARYLAND during 1960.

SEED-CORN BEETLE (*Agonderus lecontei*) was extremely abundant in March and April in eastern KANSAS; however, very little damage to corn was noted. Large numbers of adults were observed flying with the wind in Otoe County, NEBRASKA, in mid-April.

A BILLBUG (*Sphenophorus callosus*) was exceedingly abundant in a muck soil in Montgomery County, ILLINOIS, planted to corn. In early June, the stand in one field had been reduced by 50 percent, while many of the surviving plants showed feeding injury. Fourteen acres of this field were disced after some experimental treatments had been made to the soil. Corn was replanted and on June 30 over 60 percent of the plants showed leaf injury. This corn grew rapidly and most plants survived the feeding injury. Infestations of *S. callosus* were light to heavy on corn in GEORGIA during 1960, but generally much lighter than during the 3 previous years. *S. callosus* was collected on corn at Quincy, Gadsden County, FLORIDA, on April 28; 60 percent of the field was infested.

A WEEVIL (*Anacentrinus deplanatus*)occurred in damaging numbers on grain sorghum in central TEXAS again during 1960 and was also found on the high plains.

Reports of crop injury by WIREWORMS were more numerous in NORTH DAKOTA during 1960 than during 1959. *Hypolithus nocturnus* destroyed 60 percent of corn plants in a 60-acre field near Wimbleton, Barnes County. In SOUTH DAKOTA, moderate to heavy infestations of *Limonius* spp. occurred on corn, with much replanting necessary, and undetermined species of wireworms infested corn in NEBRASKA during May. Unspecified species of wireworms damaged corn in a few fields in ILLINOIS during mid-May, with reports being received from many areas of the State by early June. Up to 25 percent of plants were damaged in individual fields, with an average of 2 percent of all corn being damaged by these pests. Some fresh damage was still being found in late June. Although activity of this complex group in INDIANA is indicated by the increased use of soil insecticides, damaging wireworm populations occurred only in localized areas of the State in 1960. Considerable damage to corn by *Melanotus* spp. was evident in southeast MISSOURI in late May and early June, with some stands being taken out by these pests. From mid-June to mid-July, wireworm damage to corn was evident in spots throughout the State. In NORTH CAROLINA, wireworms were noticeably more abundant in fields of corn planted to corn for the third successive year in southeastern counties. In late May, infested fields in the Roanoke River Valley had 5-30 percent of plants injured by *Melanotus communis*, and in Hyde County, *M. communis*, *Glyphonyx* sp., *Conoderus* sp. and *C. lividus* were actively feeding on corn during the same period. Some fields with 70 percent infestations were plowed up, and *M. communis* caused a 25-percent loss in a second planting in Cleveland County in mid-June. Wireworms damaged corn in some locations in PENNSYLVANIA during 1960.

The JAPANESE BEETLE (*Popillia japonica*) adult infestation in Henderson County, NORTH CAROLINA, was the heaviest ever seen in the area and caused severe injury by feeding in whorls of corn. In Newton County, INDIANA, where agricultural land was involved, the adult population was higher than usual, although not severe enough to cause damage to corn.

Unidentified species of WHITE GRUBS caused some damage to corn in ILLINOIS during late May and June, while in July Phyllophaga rugosa damaged corn in spotted central areas of the State. White grub damage to corn following soybeans or pasture occurred in IOWA in Lyon, Osceola, O'Brien, Mahaska and Shelby Counties. Adults of Phyllophaga spp. were very numerous over the State during the year, the most numerous species being P. hirticula, P. implicita and P. rugosa. In VIRGINIA, Phyllophaga spp. infested corn in several areas.

CHINCH BUG (Blissus leucopterus) infestations were rather heavy on corn and grain sorghum in the upper coastal area of TEXAS during 1960. Damage to crops in OKLAHOMA was generally much lighter than during the preceding 2 years. During mid-August, damaging chinch bug infestations of 10-15 per linear foot were noted in some grain sorghum in Pawnee County, but populations elsewhere continued at a low level. The survey conducted during late November indicates the general trend continues toward lighter populations in 1961 throughout most of Oklahoma. Only isolated "hot spots" of limited importance are expected to develop in a band extending from the northeast to southwest corners of the State. Chinch bug was present in fields of small grain in KANSAS during April and May and migrated to sorghum and corn, where damage occurred in a few fields in central and east central areas. In NEBRASKA, chinch bug was not a problem during 1960, populations being light and scattered. Fall hibernation survey showed highest populations were located in the southeastern area of the State and no problem is anticipated in the immediate future. Migrations of chinch bug from small grain to corn and sorghum began in late June and early July in southwest MISSOURI, with economic populations observed in southwest, west central and northeast areas. Damage was confined to isolated spots in these areas and populations over the State were low during 1960.

Chinch bug was very scarce in fields of corn throughout the 1960 season in ILLINOIS, although many adults were found hiding behind leaf sheaths during the fall European corn borer survey. The fall chinch bug survey showed 26 Illinois counties rating light, medium or heavy, compared with 19 counties in 1959. Chinch bug was negligible in IOWA during the year and the fall survey indicated noneconomic populations over the southern portion of the State. Populations in INDIANA showed an increase in 1960 over those of 1959 and controls were applied in a few localized central areas. The annual survey in ARKANSAS showed fewer chinch bugs in hibernation during 1960 than in past years. The number of counties in each classification for 1960, 1959 and 1958, respectively, were as follows: Noneconomic - 15, 14, 18; light - 1, 1, 2; moderate - 2, 2, 1; severe - 0, 1, 6. Contrary to the usual migration of chinch bug into fields of corn in NORTH CAROLINA, all stages were present under clods in the field when corn came up in some fields in Hyde County in mid-April. Chinch bug infested corn in late April in Alamance, Warren and Vance Counties. This is the first time in 7 years of records that a county (Alamance) not in the Coastal Plain of North Carolina has had an infestation of chinch bug, although some county in the Coastal Plain area has been found infested every year except one during the 7-year period. LYGUS BUGS (Lygus spp.) were generally prevalent over CALIFORNIA and one of the most damaging pests on corn. STINK BUGS were also present in California and damaged corn in Imperial, Yuba and Sacramento Counties.

RUSTY PLUM APHID (Hysteroneura setariae) infestations on sorghum in ARIZONA were much later in 1960 than in 1959, but became extremely heavy in mid-October and heavy flights became a problem in early November. The pest did not occur in Yuma County.

CORN LEAF APHID (Rhopalosiphum maidis) infestations in ARIZONA became heavy in grain sorghum in early fall and continued heavy, in combination with rusty plum aphid, until harvest; and the pest was spotted on corn in CALIFORNIA, sometimes becoming severe in several locations. Corn leaf aphid increased rapidly in NEVADA during late June in Churchill, Lyon, Pershing and Washoe Counties, requiring controls in late June and July. Infestations were light to medium in other counties, requiring little or no control. In UTAH, injury to corn was very light. Large numbers of corn leaf aphid were found in 90 percent of fields of corn inspected in southeast WYOMING. This aphid appeared in late August and continued to build up until after the first heavy frost. No controls were applied in Wyoming during 1960. Corn leaf aphid populations were heavy on grain sorghum in the coastal bend area of TEXAS. Migration of this pest to corn and grain sorghum occurred in OKLAHOMA during mid-May to early June, but no unusually heavy populations occurred on these crops during the summer and early fall. The pest was present in KANSAS only in noneconomic numbers on corn and sorghum and low infestations remained constant in NEBRASKA from June through September, with very little damage occurring to corn and milo. Small numbers of corn leaf aphid were found on nearly all corn in southeastern SOUTH DAKOTA the third week in July. The population increased rapidly and was present in nearly all corn areas of the State, with counts ranging 0-500 per corn stalk, but the amount of damage is unknown.

Corn leaf aphid was widespread on corn in MINNESOTA, but populations were lower during 1960 than those encountered during 1959. The aphid was first found in a pan trap in Arlington, WISCONSIN, on May 25. By late August, populations on corn reached a peak and, although most silks had light infestations and tassels were nearly covered, parasites and predators rapidly decimated colonies. Corn leaf aphid was very abundant in ILLINOIS during 1960, with 0-70 percent of corn plants in individual fields heavily infested. Infestations of 5-10 percent were very common. Nearly all late corn plants had some of these aphids present. Infestations were quite general in INDIANA and more were found in late corn than during 1959, although the effect on yield of late corn was not apparent. Heavy infestations that were investigated showed no serious damage and many reports reflected the concern of growers following severe losses that occurred in Indiana in 1959. Heaviest corn leaf aphid infestations were found in the northeastern portion of the State. Infestations in the southern areas were higher during 1960 but not severe. Sorghums, in general, were less infested than during 1959. Light populations of corn leaf aphid occurred on corn and grain sorghum in MISSOURI from mid-July to mid-August, but no economic damage was reported. Corn leaf aphid colonies were found on corn in early July in Kent and New Castle Counties, DELAWARE, becoming increasingly heavy on corn throughout the State during the season but remained below economic proportions in most areas.

Undetermined species of THRIPS were common on most corn in ILLINOIS during 1960 but very little silvering was observed, while in MARYLAND streaking, due to various species of thrips, was noticeable on corn during the summer.

SORGHUM MIDGE (Contarinia sorghicola) occurred on grain sorghum in many areas of TEXAS, with considerable damage to late-planted varieties. As in 1959, populations of sorghum midge continued at a noneconomic level during 1960 throughout the State and were well below those noted during 1958. In southeastern MISSOURI, 100 percent of the fields of grain sorghum were infested to some degree by sorghum midge. Infestations ranged light (1-10 percent of heads infested) to heavy (75-100 percent of heads infested). Yield of grain sorghum in the area was reduced an estimated 20 percent during the 1960 season. Sorghum midge was found for the first time in CALIFORNIA in milo maize in Tulare County in October. Surveys showed this pest of general distribution in the county, with medium infestations. Four other California counties, Fresno, Kern, Madera and Kings all had trace to light infestations.

SEED-CORN MAGGOT (Hylemya cilicrura) was a problem on corn in local areas of ARIZONA during 1960 and injury in UTAH was normal or less. CORN BLOTCH LEAF MINER (Agromyza parvicornis) was heavy in some areas of CONNECTICUT on early corn and required spot treatment; and mines of this pest were present in Sussex County, DELAWARE, in late May and became common statewide by mid-July.

TWO-SPOTTED SPIDER MITE (*Tetranychus telarius*) severely damaged corn in parts of Davis, Weber, Salt Lake and Utah Counties, UTAH, and locally elsewhere in the State. The mite first appeared in WYOMING about mid-August when corn leaves had completely covered rows. Nearly all fields inspected were infested. Bottom leaves of corn in many fields were heavily damaged, resulting in loss of yield in fields cut for silage. Controls were applied to a few fields, with very little success. Two-spotted spider mite caused some loss to sweet corn in COLORADO and infested dryland and irrigated shell corn throughout the State, causing the major loss to this latter crop. Two-spotted spider mite also caused the highest loss to dryland and irrigated silage corn. High temperatures and drought contributed to high mite populations and to reduced effectiveness of controls. In CALIFORNIA, infestations of two-spotted spider mite damaged corn in Sacramento and Solano Counties and milo in Shasta County. For the first time known in NORTH CAROLINA, two-spotted spider mite attacked corn in a field in Wayne County in early July.

Heavy, damaging infestations of a SPIDER MITE (*Oligonychus* sp.) occurred in corn in panhandle counties of NEBRASKA, and *Oligonychus* spp. and/or *Tetranychus* spp. heavily infested many fields of corn in Churchill and Lincoln Counties, NEVADA. Unspecified species of spider mites heavily infested corn in spots in Yellowstone County, MONTANA.

Small Grain Insects: Several species of APHIDS were of some concern on small grain crops over the Nation during 1960. Of these, GREENBUG (*Toxoptera graminum*) and ENGLISH GRAIN APHID (*Macrosiphum granarium*) were generally not the problems they were during 1959. CORN LEAF APHID (*Rhopalosiphum maidis*), although probably not as damaging as in 1959, was of concern in some States, particularly on barley. Aphids were generally prevalent and damaging to small grains in CALIFORNIA.

The heaviest, most widespread corn leaf aphid infestation ever recorded in NORTH DAKOTA occurred on barley over the eastern area during June and July. First infestations occurred the week of June 20, when crop development was generally one week to one month later than normal and predator populations were very low. Subsequent surveys revealed a rapid increase in predators, notably syrphid larvae, so that corn leaf aphid populations were a threat only to late barley. Some untreated fields were totally destroyed by mid-July, when counts were 1,000-3,000 per linear foot. Barley in the seedling-to-joint stage sustained the most severe injury. Corn leaf aphid occurred on barley in all districts of MINNESOTA, with damaging numbers present in some scattered fields and requiring controls. Late plantings of barley in the northwest district were hit particulary hard and some fields were completely destroyed. In WISCONSIN, corn leaf aphid was first found in a pan trap at Arlington, Columbia County, on May 25. Infestations were noted on oats and barley throughout much of the State in June, but never increased to any degree.

Populations of corn leaf aphid were higher in most fields of small grain in localized areas of OKLAHOMA during the spring than reported during the last several years. Highest infestations (250-400 per linear foot) occurred in barley and wheat during mid and late April, primarily in fields in Tillman and Jefferson Counties, where controls were applied in many cases. Populations continued at normal levels (0-10 per linear foot) in a small percentage of fields of small grains until mid-May to early June, when migration to newly planted corn and grain sorghum occurred. No unusually heavy infestations occurred in fall-seeded small grains during fall and early winter periods. Corn leaf aphid populations were heavy on barley in north central TEXAS during 1960, but light to moderately heavy infestations occurred in barley in Dona Ana County, NEW MEXICO, during the spring. In ARIZONA, corn leaf aphid populations became heavy in barley during March but were generally later and lighter than during 1959. The pest required some controls on barley in COLORADO during the season. Corn leaf aphid populations were down in MONTANA during 1960 and barley yellow dwarf virus was present only in Carbon County. In OREGON, corn leaf aphid damaged barley in Malheur County.

Greenbug was first noted in WISCONSIN on June 14 in Grant County and the first sign of red leaf disease was observed in Richland County in a field of oats on June 15. Greenbug counts were about 2 per sweep as late as July 11 in these districts. In western and central light soil areas, greenbug populations increased to 50 per 10 sweeps on June 22, then decreased rapidly as predators and parasites increased and grain neared maturity. Greenbug was present in MINNESOTA for the second straight year but infestation was not as severe as during 1959. This was probably because weather conditions were more favorable for predator development and the initial infestations occurred more than a month later than during 1959. Infestations were generally light, with only an occasional field showing damage. Oats were again the preferred crop in Minnesota during 1960, with wheat having some high infestations. Greenbug was present in the eastern edge of SOUTH DAKOTA during 1960, but due to weather conditions remained noneconomic. Low populations of greenbug were present in 40 percent of fields of small grain in southeastern NEBRASKA counties during 1960 and only noneconomic numbers occurred in KANSAS. Greenbug was present in most fields of wheat checked in MISSOURI, but was extremely low in numbers; and infestations were of little importance in ARKANSAS during 1960, with only one field observed having economic damage.

Although the buildup of greenbug populations in OKLAHOMA during November and December 1959 was heavier than that of the same period in 1958, late winter and early spring outbreaks in 1960, generally, did not materialize. Economic damage occurred in the Red River Valley in early April and by mid-April was becoming common in sandyland areas in river bottoms in south central, central and north central Oklahoma. Only a few thousand acres in the State developed medium to heavy infestations and the majority of these were eventually controlled by hymenopterous parasites. The overall greenbug infestation in the State was somewhat heavier than during 1958, but considerably lighter than the 1959 outbreak. The 1960 fall buildup was slow but gradually increased until mid-December, when cold weather caused a leveling off or slight decrease in numbers. Counts averaged less than 10 per linear foot in almost all fields surveyed throughout Oklahoma at this time, with only 3 fields in Kingfisher and Payne Counties having medium to heavy greenbug populations of 50-100 per linear foot.

Only an occasional light infestation of greenbug occurred on wheat in Quay, Curry, De Baca and Roosevelt Counties, NEW MEXICO; and infestations were relatively light in panhandle and high plains areas of TEXAS, with some economic damage occurring in the north central area. Greenbug infestations in oats were scattered and generally light in LOUISIANA; however, a few infestations in the northern part of the State were heavy, ranging up to 1,000 per linear foot. First heavy infestations were noted in February; populations decreased until April and increased thereafter. Search and survey for greenbug were negative in NORTH CAROLINA during the winter of 1959-60. However, infestations had killed 25-75 percent of some fields of oats and rye in Nash County by early December 1960, and portions of other fields were turning brown.

English grain aphid accounted for approximately 85 percent of the aphids on oats in WISCONSIN during the 1960 season. This grain pest began appearing on oats in Crawford County by May 27, increasing rapidly throughout most of the State. Populations per sweep had reached 60 in northeast, 30 in south and southwest and 40 in central regions by mid-July. As grain ripened and predators increased, English grain aphid populations decreased. English grain aphid was found in the eastern edge of SOUTH DAKOTA during 1960, but due to warm weather was noneconomic. Along the southern border of NEBRASKA, English grain aphid occurred in very low, spotted populations from May through June, counts averaging 4 per 10 sweeps; and the pest was present in KANSAS only in noneconomic numbers. English grain aphid infestations in OKLAHOMA were light (less than 10 per linear foot) and present only in a small percent of small grains from early January to harvest in June. This was the first aphid found in small grain in the fall of 1960, but again populations, without exception, continued at a low level of less than 15 per linear foot and occurred in only an estimated one-fourth of the fields surveyed throughout Oklahoma. English grain aphid was present in most fields of wheat checked in MISSOURI during 1960, ranging 0-6 per foot of row.

Infestations of English grain aphid were light on wheat, statewide, in ARIZONA during April and May. Infestations were lower than during 1959 and the pest was of little importance during 1960. In NEVADA, English grain aphid was light to medium in some areas, but was heavy and required controls in Humboldt County. This pest was rarely damaging in UTAH during the 1960 season. Losses to wheat in COLORADO from English grain aphid were light in western and southwestern sections, with some controls required on barley.

Adults and nymphs of English grain aphid were present on cereals and cover crops in most areas of DELAWARE by mid-April. Generally, infestations were present to common on these crops statewide, with the exception of one field of oats in Kent County where aphids became very abundant in late May. In MAINE, spring migrants of English grain aphid began moving in late June, at which time populations were light on oats.

APPLE GRAIN APHID (Rhopalosiphum fitchii) occurred on barley plantings in CALIFORNIA, mostly in the northern area; very low on small grains in NEBRASKA; noneconomic in KANSAS; and present in MISSOURI in extremely low numbers (0-6 per foot of row) in most fields of wheat checked. Apple grain aphid was fairly numerous in isolated fields in many areas of OKLAHOMA. Populations in a field of barley in Kingfisher County reached over 1,000 per linear foot during March, with effects of feeding being quite evident on plants. Generally, however, apple grain aphid populations averaged 20-75 per linear foot during the spring and 10-25 in the fall and early winter in Oklahoma, with approximately 10 percent of fields surveyed found infested. In LOUISIANA, spotty infestations of apple grain aphid occurred on oats near Hathaway, Jefferson Davis Parish, and in MAINE, heavy populations damaged oats in some Aroostook County areas during early July.

Several other species of aphids were reported as infesting small grains. A WHEAT APHID (Brachycolus tritici) damaged wheat in some panhandle counties of TEXAS during 1960. Isolated infestations of a ROOT APHID (Rhopalosiphum rufiabdominalis) in a few fields of small grain caused some concern in Okfuskee County, OKLAHOMA; thisis one of the few confirmed outbreaks of this species in the State, according to available State records. An undetermined species of SUBTERRANEAN APHID was found on crown and upper roots of wheat plants in Red Willow County, NEBRASKA, closely associated with a colony of ants. An undetermined APHID species had caused destruction of a 10-acre field of oats in Duplin County, NORTH CAROLINA, by mid-November.

APHID vectors of disease failed to develop on winter cereals and perennial grasses in the Willamette Valley of OREGON until June, contrasting with heavy infestations and subsequent disease problems in 1958-59.

FALSE CHINCH BUG (Nysius ericae) remained noneconomic in SOUTH DAKOTA during 1960. The population of this pest was approximately 20 percent of that of 1958 and was spottedly numerous about fields of grain and along roadsides.

Populations composed of 95 percent SAY STINK BUG (Chlorochroa sayi) and 5 percent CONCHUELA (C. ligata) damaged small grains in Curry, Hidalgo, Torrance and Luna Counties, NEW MEXICO. Several fields checked averaged 1-2 bugs per head of grain. In NEVADA, Say stink bug developed heavy infestations on grain in Nye County during May and caused heavy damage in some fields. STINK BUGS were generally prevalent in CALIFORNIA and were reported damaging cereal grains in Imperial, Yuba and Sacramento Counties.

RICE STINK BUG (Oebalus pugnax) continued to attract attention in ARKANSAS during 1960 and some fields of rice were treated for control. Populations of this pest ranged light to medium in rice areas of TEXAS and populations in fields of rice in LOUISIANA were much reduced during 1960 as compared with 1959. The pest was not a problem in oats in Louisiana during the past season.

A total of 345,600 acres of rice (including repeat examinations) were surveyed during the period May through November for RICE DELPHACID (Sogata orizicola), the vector of hoja blanca disease of rice, in LOUISIANA, with negative results. A closely related species, S. cubana, was found in 3 parishes, for a new record for the State. One specimen was collected in each of Avoyelles, St. Martin and St. Mary Parishes.

A MIRID (Thyrillus pacificus) caused injury to margins of fields of wheat in OREGON during early May. This species, along with 2 other mirids (Stenotus binotatus and Leptopterna ferrugatus) damaged grains spottedly in scattered areas of UTAH during the 1960 season.

Very low populations of SIX-SPOTTED LEAFHOPPER (Macrosteles fascifrons), averaging 2 per 10 sweeps, occurred in small grains throughout NEBRASKA; and the pest was noneconomic during 1960 in SOUTH DAKOTA, except in a few very small areas. Low populations were recorded in most fields of small grain surveyed in NORTH DAKOTA.

Several species of ARMYWORMS caused some economic damage during the 1960 season, with FALL ARMYWORM (Laphygma frugiperda) being the most destructive. Damage to cereal crops by this pest was not as serious as that to some other crops, however. Fall armyworm was of little economic importance in INDIANA, but some damage did occur to fall-seeded grain in the extreme southern portion of ILLINOIS. Fall armyworm completely destroyed stands of fall-seeded wheat, rye, oats and barley in a few fields in eastern KANSAS. In the southwest area of MISSOURI, stands of fall-seeded rye and barley were damaged from mid to late September, with some of these fields damaged to the extent that they could not be used for fall pasture. Fall armyworm infestations occurred in scattered areas of ARKANSAS in fall-seeded grain. In TENNESSEE, fall armyworm was prevalent in new fall pasture, small grain and alfalfa seeding in the center of the State, with effective controls being applied to about 5,000 acres. Medium to heavy damage by fall armyworm to small grain was common in all areas of OKLAHOMA during September and October, and was the heaviest widespread damage noted in the State during the past several years; and populations were extremely heavy during early fall on young small grains in TEXAS, causing extensive damage throughout the State. Fall armyworm caused some damage to rice in St. Tammany Parish, LOUISIANA, averaging 1 per sweep in 1 field; and local infestations of fall armyworm occurred on fall rye and other small grains in VIRGINIA.

ARMYWORM (Pseudaletia unipuncta) was generally of no particular concern during 1960. In SOUTH DAKOTA, however, armyworm caused much damage to wheat in the north central area during early May, remaining serious through June and averaging as high as 3 larvae per linear foot on wheat in some localities. In MONTANA, oats were damaged in Dawson and Rosebud Counties. A few scattered reports of the occurrence of armyworm were received from southwestern, southeastern and south central districts of MINNESOTA, with an occasional report of a field of oats being destroyed in the southeast district. Armyworm infestations in INDIANA were below normal during 1960, and light infestations occurred on wheat in eastern crop reporting districts of NEBRASKA. Armyworm damaged a few fields of wheat in central and south central areas of KANSAS during June. The first armyworm larvae of the season in MISSOURI were observed in the southeast area the first week in May. From early to mid-June, damage was evident to small grain in central and southeast areas and was limited to fields that had heavy, dense growth. Counts in these rank fields ranged 4-12 larvae per square foot. By the first week in July, armyworm activity throughout Missouri had ceased. Infestations of this pest were extremely light in small grain in ARKANSAS, where the annual survey in late April showed an average of only 1.53 larvae per sweep. No economic infestations occurred in the State during 1960. Damaging armyworm infestations began appearing in small grains in southwest, west central and north central OKLAHOMA during late May. Heaviest infestations were most commonly found in bottomland fields having rank growth. Although damaging infestations of armyworm were somewhat spotty in affected areas, light numbers of 0-2 per square foot were fairly common, especially in field margins. Armyworm infestations in TEXAS caused some economic damage to small grain, but was not a problem on oats in LOUISIANA during 1960. Armyworm larvae remained present in all areas of DELAWARE throughout the growing season, causing light injury to oats.

Small numbers of unspecified ARMYWORMS were present in fields of small grain and grasses throughout ILLINOIS, the maximum number reported being 15 per linear foot of row in wheat. A total of 81,194 acres of small grains and grasses were treated for control in eastern, east-southeastern, central, west-southwestern and southwestern sections of the State. Of the 2 economic infestations of these pests reported in NORTH DAKOTA during 1960, one was in oats near Bismarck, Burleigh County.

Several species of CUTWORMS were responsible for some losses to grains in the Nation during 1960, but most infestations were light or moderate. Light to moderate populations of ARMY CUTWORM (Chorizagrotis auxiliaris) occurred in NEBRASKA during the year but damage to wheat in Cheyenne, Kimball, Banner and Scotts Bluff Counties was minor as larvae averaged only one per linear foot. Heaviest moth flights occurred in the western half of the State during the last 2 weeks of May, but fall flights in Nebraska would indicate possible damaging infestations during the spring of 1961 in panhandle and southwestern areas of the State. A very light infestation of DARK-SIDED CUTWORM (Euxoa messoria) was found in wheat in Box Butte County in mid-May. Very light infestations of PALE WESTERN CUTWORM (Agrotis orthogonia) were found on small grain in western Nebraska, with less than one larva per foot of row. Army cutworm and BLACK CUTWORM (Agrotis ipsilon) were not of economic importance in KANSAS during 1960. In OKLAHOMA, several undetermined species of cutworms were common in limited numbers of fields of small grain during May and June but apparently caused only slight damage. Army cutworm was found in wheat in some panhandle areas of TEXAS and infestations of black cutworm and VARIEGATED CUTWORM (Peridroma saucia) in small grains were heavy enough in some areas to cause some economic damage. Several species of cutworms were a problem in local areas of ARIZONA in small grains. In COLORADO, army cutworm caused slight losses to wheat in western and southwestern parts of the State, and caused much less damage to small grain in UTAH than usual. Heavy infestations of pale western cutworm occurred on small grain in Valley, Roosevelt and other northwestern counties of MONTANA, and infested fields of barley in Lewis and Clark County.

STALK BORER (Papaipema nebris) was more prevalent in INDIANA during 1960 than during 1959 and was found in wheat stems. Infestations were more common along weedy fence rows. Stalk borer caused a very minor amount of damage to small grains in eastern KANSAS, while light infestations were noted in marginal rows of wheat in southwestern MISSOURI in mid-June.

BEET WEBWORM (Loxostege sticticalis) required some controls on barley in COLORADO, and SALT-MARSH CATERPILLAR (Estigmene acrea) was a problem on small grains in local areas of ARIZONA. WHEAT HEAD ARMYWORM (Faronta diffusa) was present in KANSAS in noneconomic numbers during the 1960 season.

WIREWORMS were damaging to small grains in some areas during 1960. Populations were above normal in OREGON, with GREAT BASIN WIREWORM (Ctenicera pruinina) causing considerable localized damage to small grains in Sherman, Gilliam and Morrow Counties. Wireworms caused local, spotted damage to grain fields in CALIFORNIA, but without extensive damage. Reports of crop injury by wireworms during 1960 were more numerous in NORTH DAKOTA than during 1959, with small grains being attacked at several locations. Moderate to heavy infestations of Limonius spp. occurred on wheat in SOUTH DAKOTA, necessitating much replanting. In NEBRASKA, reports during May showed infestations of undetermined species of wireworms on wheat, with a field in Perkins County being 90 percent infested. Undetermined species of these pests caused localized damage to a few fields of fall-seeded small grain in several localized areas of OKLAHOMA during the early fall of 1960.

RICE WATER WEEVIL (Lissorhoptrus oryzophilus) was very active in LOUISIANA and caused considerable damage to several fields of rice. In 26 fields surveyed at the end of June, larvae ranged 28-256 per square foot, but by July 15 populations began to decrease. In ARKANSAS, seed treatment has become more general for the control of this pest of rice.

CHRYSOMELIDS (Maecolaspis spp.) were responsible for reducing stands of rice in Jefferson Davis and Allen Parishes, LOUISIANA, by 20-50 percent where rice followed lespedeza. In ARKANSAS, a survey conducted in the spring showed the number of overwintering Maecolaspis spp. larvae in rice to be much lower than in 1958 and 1959. As in the case of rice water weevil, seed treatment has become more general for the control of these pests of rice in the State.

Undetermined species of WHITE GRUBS damaged fall-seeded wheat in a few fields in northeast and south central KANSAS, and caused localized damage to a few fall-seeded fields of small grain in several scattered areas of OKLAHOMA during early fall. Phyllophaga spp. infested barley in several areas of VIRGINIA; and larvae of GREEN JUNE BEETLE (Cotinis nitida) injured fall-planted small grain seedings over TENNESSEE, with soil insecticides being used for control.

HESSIAN FLY (Phytophaga destructor) populations continued to increase in INDIANA during 1960, being slightly over those of 1959. Susceptible wheat averaged 15.3 percent infested, with resistant varieties averaging 0.3 percent infested. Hessian fly was abundant in some southern areas of ILLINOIS during 1960, with a few fields of wheat so badly damaged they were plowed under. A few fields also had severe stalk breakage and reduced yield. A survey in 10 fields in the west-southwest section of the State in late June showed 0-100 percent (averaged 65 percent) of stems infested, with an average of 1.6 larvae or puparia per stem. Hessian fly occurred in wheat in Wright and Meeker Counties, MINNESOTA, for the first time since 1941, with moderate populations in fields checked. However, as very little winter wheat is grown in the State, no statewide problem is foreseen.

The hessian fly survey in southeastern counties of NEBRASKA during mid-April revealed flax-seed stages in 50 percent of fields of volunteer wheat. Infestations remained approximately 3 percent during the spring and summer surveys in southeast and south central areas of the State, but there was a moderate to heavy infestation of flax-seed stage in several Furnas County fields during November. Hessian fly did not develop into a problem in harvested wheat in KANSAS during 1960. However, early seeding of wheat and favorable weather caused an increase of adults during the fall. The wheat stubble survey in MISSOURI showed hessian fly populations were down in every district. The average percent infestation for the State in 1960 was 2.7 compared with 9.1 for 1959. Extremely wet weather at planting time in Missouri delayed planting of wheat in most cases until well after the fly-free date.

Light numbers of WHEAT STEM MAGGOT (Meromyza americana) were noted in fields of wheat in southeastern NEBRASKA in June and July and the pest was present in only noneconomic numbers in KANSAS during 1960. A LEAF MINER (Hydrellia griseola) occurred in rice plantings in varied populations in Butte, Glenn and Sacramento Counties, CALIFORNIA.

Infestations of WHEAT STEM SAWFLY (Cephus cinctus) ranged 0-76 percent, average 12 percent, in pre-harvest survey in northwestern counties of NORTH DAKOTA. This is an increase of 2 percent over the infestations of 1959. Threatening infestations of this sawfly occurred in Renville, Bottineau and northern Ward Counties. Another SAWFLY (Dolerus sp.) was very abundant in small grain in many areas of ILLINOIS and was probably responsible for some of the treatments applied to wheat against armyworms. WHEAT JOINTWORM (Harmolita tritici) was present only in noneconomic numbers in KANSAS during the 1960 season.

Extremely high populations of BARLEY THRIPS (Limothrips denticornis) occurred over the eastern half of NORTH DAKOTA during 1960. Delayed crop development and an earlier than usual migration to barley contributed to a rapid increase in infested plants. Controls were applied to a larger acreage in the State than in previous years.

High populations of FIELD CRICKETS (Acheta spp.) in eastern and central areas of NORTH DAKOTA caused some damage to swathed grain and controls were applied in some areas of the State for crop protection. Populations of field crickets were also high in SOUTH DAKOTA during the fall of 1960.

BROWN WHEAT MITE (Petrobia latens) developed heavy populations on grain in northern counties of NEVADA during the season and caused moderate economic damage in Juab, Box Elder, Tooele, Salt Lake and San Juan Counties, UTAH, before spring rains. Although loss to wheat from brown wheat mite was light in COLORADO, highest losses occurred in the southeast portion of the State. This pest necessitated some controls on barley in Colorado, but was not of economic importance on grain in KANSAS during 1960. Damaging infestations of brown wheat mite of up to 500 per linear foot were common in fields of small grain in a localized area of Beaver and Texas Counties, OKLAHOMA, during May, with feeding effect quite evident in infested fields. Light to medium infestations of brown wheat mite occurred in the panhandle area of TEXAS in 1960.

WHEAT CURL MITE (Aceria tulipae) infestations were light in WYOMING during 1960. A few fields in the southeast area were infected with wheat-streak mosaic, but damage was light. Fairly heavy populations of wheat curl mite were found on fall-planted wheat in the Carpenter area of Laramie County during late September and early October. Wheat curl mite was generally low in numbers in KANSAS during 1960, with only very limited damage by wheat-streak mosaic occurring in the harvested crop.

Light infestations (generally less than 25 per linear foot) of WINTER GRAIN MITE (Penthaleus major) were common in a small percentage of fields of small grain in many areas of OKLAHOMA during the spring of 1960 and again the following fall and winter; and general, light infestations of this pest occurred on oats in Solano County, CALIFORNIA.

Infestations of BANKS GRASS MITE (Oligonychus pratensis) on timothy in Lyon County, NEVADA, were heavy, with many stands being killed out.

A TADPOLE SHRIMP (Triops longicaudatus) caused moderate damage to rice plantings in Sacramento and Glenn Counties, CALIFORNIA. Damage is generally associated with hydrophylids.

Sugarcane Insects: SUGARCANE BORER (Diatraea saccharalis) egg masses first appeared in LOUISIANA sugarcane about mid-April, reached a peak by mid-May and disappeared by the first week of June. Larval feeding signs were first noticeable the first week of May and first deadhearts appeared during mid-May, increasing steadily thereafter. About one percent of first-generation larvae had pupated by the first week of June. A heavy infestation of LESSER CORNSTALK BORER (Elasmopalpus lignosellus) developed in sugarcane grown in a greenhouse in May and later in sugarcane grown at the Louisiana State University sugar station in July.

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